Investigating Academics' Voluntary Usage of a Learning Management System

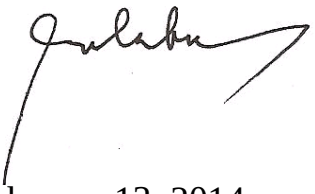
A thesis submitted in fulfilment of the requirements for the degree
Doctor of Philosophy

Cenie M. Vilela-Malabanan
Master of InformationTechnology, QUT
PgDip Commerce (Info Sys), UOW
B of Engineering Technology (Electronics), MSU-IIT

School of Business I.T. and Logistics
College of Business
RMIT University
February, 2014

Declaration

The work contained in this thesis has not been submitted to meet requirements for an award at this or any other higher educational institution. To the best of this researcher's knowledge and belief, this thesis contains no material previously published or written by another person except where due reference is made. This researcher is the author of this thesis.

Signature 

Date: February 13, 2014

Acknowledgements

The Holy Divine has always been my constant companion in my life's journey. He never fails to shower me with infinite wisdom, patience and understanding which made me surmount the rigors in the making of this research study. To Him I give the greatest glory.

My unending debt of gratitude also goes to the following institutions and people:

RMIT University and MSU-Iligan Institute of Technology (MSU-IIT) for awarding me a scholarship grant for my doctoral studies. The executive management of MSU-IIT for allowing me to collect computer log data for this thesis and to my research participants from MSU-IIT for engaging me with their honest and insightful answers in the course of the interviews;

Martin Dick, Konrad Peszynski, and Vince Bruno, my supervisors, for their guidance and patience on this PhD journey. I am lucky for having them share their experiences, expertise, and wisdom. The joyful and cheerful consultations and meetings we had are priceless;

Brian, Peter, Charles, Caroline, Shams, Nilmini, Prue, Georgia, Patricia, and Lise, my mentors and friends from SBITL: for their support and understanding during my initial and final stay at RMIT;

Tom, Bill, Hidaya, FuMei, Hoda, Aswini, Sri, Ilya, my co-researchers, and the others whom I failed to mention. The challenges of HDR's that we had surpassed at different stages made us wiser, stronger and tough! Thanks for the cheers, laughter, and support;

My spiritual family in Melbourne: the Missionaries of Charity sisters and co-workers, and most especially the ITM family members: Maureen, Stella, Ignatius, Raj, Laura, Cherryl D., Cherryl G., Nick, Olivia, and Dianne. Mau for keeping an eye on my writings and offering special prayers and novena, and Fathers Tony, Herman, Aurelio, and Alfred for the prayers offered in their masses;

My 'kapamilya, kapuso and kapatids' for the hilarious and Pinoy 'flavoured' jokes; and for listening to my whines and woes: Ana (liit, my 'adopter'), Lilac, Robbie, Marianne, Malou, Tonnette, Kate, Bernie, Letty, and Eleanor. Big thanks also to the homey weekend 'fiesta treats': Ana (laki), Alvin Vinu, Manong, Kathy, and Dennis; Tolits, Tey, Colo & Ico. Mumcy and Gen, my BFFs who kept their 'lines' open every time I need somebody to talk to about home; and

My family for their constant love, support, and fervent prayers helped me through, especially in bad and tough times. They are always one with me in my aspirations. To my Inay – Numing, and Tatay – Eyong – thank you for believing and trusting my capacity and decisions, and helping 'build' my dreams. To my siblings – ABDEFHIG, whom I shared my desires to fulfill my dreams. To my kids – Honey, Sugar, and Candy for inspiring and giving me hope always; thank you for behaving and cooperating with me – every time I am away to pursue my studies.

Again, my sweetest THANKS.

For each new morning with its light,
For rest and shelter of the night,
For health and food, for love and friends,
For everything Thy goodness sends.
~Ralph Waldo Emerson

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List of Abbreviations

CEO –	Chief Executive Officer
CFS –	Critical Success Factor
CLE –	Collaboration and Learning Environment
CMS –	Course Management System
COI –	Community of Inquiry
DV –	Dependent Variable
ELS –	E-Learning System
GT –	Grounded Theory
GTM –	Grounded Theory Method
HCI –	Human-Computer Interaction
ICFSS –	Institute Computer Facility and Support Services
ILS –	Integrated Learning System
IS –	Information system
IUPUI –	Indiana University – Purue University Indianapolis
LE –	Learning Environment
LMS –	Learning Management System
MICEL –	MSU-IIT Center for E-Learning
MOLÉ –	MSU-IIT Online Learning Environment
MSU –	Mindanao State University
MSU-IIT –	Mindanao State University – Iligan Institute of Technology
MSUS –	Mindanao State University System
PLATO –	Programmed Logic for Automatic Teaching Operator
SAMS –	Student Administration Management System
TAM –	Technology Acceptance Model
TICCIT –	Time-shared, Interactive, Computer-Controlled, Information Television
UBC –	University of British Columbia
UTAUT –	Unified Theory of Acceptance and Use of Technology

Abstract

This research investigates the voluntary usage of a learning management system (LMS) in a blended learning environment used by academics. With the prevalent use of educational technologies including the LMS, a mix of traditional face-to-face and web-based technologies has become an alternative mode of instructional delivery in higher education. However, despite the reported benefits in many studies about the use of LMS, the uptake of using the system is not maximized by students and by academics.

The problem this research seeks to answer is: how do academics use the LMS in a voluntary context? Research on academics' IS usage focusing on blended learning environments and on the perspective of different academic disciplines is scarce, particularly on a voluntary mode. This study has considered these discrepancies in this investigation.

This investigation was conducted in Mindanao State University-Iligan Institute of Technology (MSU-IIT), a university based in Southern Philippines. Thirty-three academics from different disciplines and professorial levels participated in this study. The LMS used in this university is Moodle, which has been implemented as a trial system in the latter part of 2002. In the first quarter of 2003, the LMS was used by enthusiastic academics. Since then however, usage among academics had not dramatically increased. Records of computer logs (usage between June, 2011 to April, 2012) indicate that only 30% of academics used the LMS. Thus, this study was conducted to investigate why the uptake of the LMS is minimal.

Two major processes were carried out in this investigation. Firstly, a one-hour, one-on-one in-depth interview with each participant was conducted. Interviews were transcribed and then coded in three stages: open, axial, and selective coding. Secondly, computer logs of each of these participants were gathered. Computer logs were processed using a simple data mining procedure and analyzed using descriptive statistics. The mixed data were analyzed using a grounded theory approach. This study used the eight-step process of building theory from case studies (Eisenhardt (1989). Supported with literature and this researcher's personal experiences with the LMS, these processes were carried out to examine how academics use the learning management system in MSU-IIT.

The overarching findings in this study suggest that academics have different levels of acceptance of using the LMS. The benefits they get from using the LMS are associated with their motivation and their own disposition to use the system. More importantly, the study has provided support that academic disciplines have crucial influences to the voluntary usage of the LMS. This research found that there are varied approaches for each course, and more specifically, on subject content that can best fit a blended delivery of instruction.

This thesis is significant in two aspects: Firstly, a model has emerged that has incorporated the four concepts: the drivers' concept and three environmental constraints concepts, which are: training, learning environment, and institutional level constraints. In this research context, the drivers concept are motivators which are associated to positive attitudes towards the LMS. While environmental constraints concepts are factors that have affected academics' voluntary use of the system. However, lessons were learned from experts that *the existence of constraints represents opportunities for improvement* (Rahman, 1998). To make good use of constraints in this thesis, this is an opportunity for the university's executive management to consider this model to improve or help in their strategic plans in relation to the pursuit of blended learning.

Secondly, this study has provided a solid groundwork for the proposed model of voluntary LMS usage presented in this study. A framework that highlights necessary measures to increase or improve the voluntary use of the LMS was proposed. It is important to consider that academics' use of the LMS largely rely on the conditions they are in. Academics' voluntary use of the system can be influenced by the socio-technological landscape of the learning environment. Thus, this thesis proposed a measure of voluntary LMS usage as an 'extra rich' measure described as: the extent and way to which the user employs the system to carry out tasks given the environmental conditions that the user is situated.

CHAPTER 1

1 INTRODUCTION

This study proposes a model of voluntary system usage by investigating academics' use of the learning management system (LMS) being utilized in a blended learning environment in a higher education, MSU-Iligan Institute of Technology (MSU-IIT). Since its inception until this research was conducted, only an approximate 30% of the number of academics in MSU-IIT have been using the system. Thus, this research looks into voluntary usage as opposed to adoption or implementation because implementation issues are not relevant at this stage. The system has long been implemented since the latter part of 2002. Implementation is not anymore a problem, because the system has been found to be stable and robust. Furthermore, some earlier implementation challenges have already been solved bythe dedicated IT support staff and the continuous back-up of the university administrators. By doing a case study on MSU-IIT, this research would be able to propose a model of voluntary LMS usage.

The 21st century has seen several technological advances, especially in the way the corporate and educational sectors accomplish things. Most of these advances were developed in the 20th century (Garrison & Kanuka, 2004), but have only begun to see widespread adoption in schools and workplaces.

Schools, colleges, and universities have been responsible for training students in traditional and established areas, providing graduates with basic skills that allow them to join the workforce. Academics look after the training and education of students, in alliance with administrators of educational institutions. Thus, academics are expected to have adequate skills and knowledge to impart to their students.

Nowadays, universities keep abreast with technologies in many of the transactions in their administrative functions. In the same manner, the teaching and learning environment is supplemented with technological tools, such as audio and video devices in the classroom, to help academics and students present their lessons. Research trends have shown that the use of the Web over the last decade has begun to dominate tertiary education (Moore, 2007; 2013). The learning environment has extended from the four-walled classroom to the virtual domain

with the aid of Web technologies. The Web has become a viable option for academics to deliver their courses in several disciplines.

The mix of delivering courses in a traditional classroom and the provision of electronic courseware resources has developed the notion of a blended learning environment. This environment has incorporated not only audio and video resources, but also web technology such as a learning management system (LMS). Along with the shift to learner-centered approaches to teaching and learning, this paradigm shift is challenging to both academics and students, opening opportunities for research in this field. Research and development agenda for educational technologies outcomes are geared toward all sectors in the educational context. However, several studies on blended learning environments have focused only on the learning outcomes of students. Studies on academics' readiness to use, or even actual use of technologies are scarce.

This chapter is organized as follows: section 1.1 and 1.2 presents the background and context of the study respectively. In section 1.3, research aims and the research question are stated. Section 1.4 outlines the contributions of the study, and section 1.5 enumerates and describes the outline of this thesis.

1.1 Background of the study

Types of information systems (IS) abound and have been researched in different contexts. Transaction processing systems, office systems, decision support systems, knowledge management systems, database management systems, and office information systems are among the types of IS used in the corporate, industry, government, and education sectors (Barki, Rivard, & Talbot, 1988). Yet, IS research context varies in each domain, and has been studied in aspects of software and hardware features, data, people, and procedures (Silver, Markus & Beath, 1995). One context that has important bearing in IS research is system usage. DeLone and McLean (2003) has influenced the call for a close and further research on IS usage construct.

System usage has been researched in the domains of IS success, IS acceptance, IS implementation, and IS for decision-making (Burton-Jones & Straub, 2006). These four research domains are briefly described in the literature review section. Burton-Jones and Straub (2006) contended that information systems usage construct has already been studied in earlier works (e.g. Barkin & Dickson 1977; Doll & Torkzadeh, 1998; Goodhue & Thompson,

1995; Igbaria & Tan, 1997). However, he argues that IS usage did not have a specific definition. Hence, Burton-Jones and Straub (2006) reconceptualized IS usage as an activity that has three elements: user, system, and task. The definition given in Burton-Jones and Straub (2006) was specific to individual-level system usage, stated as: "an individual user's employment of one or more features of a system to perform a task" (p. 6).

In another level of use Burton-Jones and Gallivan (2007) presented a multilevel perspective. In this study, they argued that system usage at any level of analysis has the same three elements (of user, system, and task). Thus, the individual and multilevel studies of system usage do consider each of the three elements that can be further studied. Levels of IS usage are viewed at the individual and collective levels, or on a multilevel perspective (Burton-Jones &Gallivan, 2007). Collective levels consider groups, firms, organization, or nations. Levels of IS usage are used to indicate outcomes in terms of learning and job performance (Torkzadeh, Chang & Hardin, 2011). Moreover, levels of IS usage can also be used to measure the amount of effort carried out in doing tasks, whether on the individual or collective level. For example, on the individual level, work-based learning is enhanced when experimenting with new things using technology (Lambrecht, Redmann, & Stitt-Gohdes, 2004) whereas, on the collective level, work-based learning takes place when people interact with one another and develop shared understandings to accomplish a task (Raelin, 1997). The use of information systems, as in knowledge management systems, contributes to work-based learning – from the individual to the group, and then to the whole organization. Such flow of work-based learning characterizes the 'learning organisation' (Torkzadeh, et al, 2011, p. 70). In this thesis, the system usage investigation is confined in the individual level that is used in a blended learning environment.

Grange and Benbasat (2011) put forward the idea that understanding the benefits individuals derive from IS is a long-standing theoretical and practical issue. They further emphasized the importance of investigating how individuals use information systems to better achieve their goals (Grange & Benbasat, 2011). Individuals have varied objectives when using IS in various environments. In an education context, individual stakeholders are the students and academics who interact in the teaching and learning process.

The teaching and learning paradigm, especially in higher education, has shifted from the traditional classroom to a web-based learning environment. Information systems that include learning management systems (LMS) and Web 2.0 technologies are commonly used by academics and students in these learning environments. An LMS is one type of information

system that does more than automate some processes, such as immediate scoring of test results. Other tasks that are not possible in a traditional classroom are easily manageable with the use of this system. In general, there are studies that claim the novelty and usefulness of an LMS. However, in this research, it is observed that percentage-wise, the level of interest of academics in MSU-IIT was not substantial. The interest level redound to the usage of LMS in this university, thus, this brings us to the main agenda of this research – to find the reasons why. Hence, IS usage is seen as a potential research agenda. With a reconceptualized definition of system usage and the view of related activity with information system use (Barki, Titah, & Boffo, 2007), the interest in the concept of IS use has expanded to the use of LMS.

In most developed countries like Australia, LMS in universities are already largely used to support the teaching and learning process (Samarawickrema & Stacey, 2007). The case is not the same for universities in developing countries, like the Philippines. Arguably, regardless of the differences in economic status, it is found that universities in developed and developing countries have problems in system usage. Some common reasons may be shared among academics from both economies, but there could be more different reasons for those in developing countries.

Research on academics' IS usage focusing on blended learning environments and on the perspective of different academic disciplines is scarce, particularly on a voluntary mode. This study has considered these discrepancies in this investigation.

The objective of this study is to investigate how academics in a tertiary educational institution use an LMS in the delivery of courses in the undergraduate and graduate degree programs. In particular, the voluntary usage of an LMS was explored. While there are new studies that look into the usage of information systems, studies about the voluntary use of an LMS by academics have not been found. In a voluntary mode of implementation, academics and students are not necessarily required to use the system, unlike in a mandated mode of implementation. Although usage is voluntary, a recommendation from higher authorities of the organization exists, which is the case in MSU-IIT. Moreover, in a voluntary mode, the facilities and technical manpower are also provided by the organization to enable the interested parties to use the features of the system when needed. In contrast, mandated use of information systems has official directives from the management hierarchy to implement the system using the facilities provided by the university or organization. Subsequently, if it is mandated, a policy is enforced on the constituents to use the system in its implementation.

1.2 Context of the study

This study was conducted in Mindanao State University-Iligan Institute of Technology (MSU-IIT), one of the universities in the Southern Philippines that use an open-source course management system – Moodle. MSU IIT offers undergraduate and graduate programs in six colleges (Arts and Social Sciences, Business and Accountancy, Education, Engineering, Science and Mathematics, and Nursing), and two schools (Computer Studies, and Engineering Technology). There are at least three academic disciplines in each of the colleges and schools. There were 491 academics/teaching staff and 11,159 students when this study was started in May 2012.

The early version of Moodle was customized at MSU-IIT in the latter part of 2002 through the initiatives of an academic who also has since served as the system administrator of the Institute Computer Facility and Support Services (ICFSS, or computer center). Training of interested academics was conducted as a trial system of the LMS in December 2002. This researcher was tasked to conduct the training along with the system administrator and two other academics. Usage of the LMS began in the first quarter of 2003 by early adopters– academics from different disciplines. Eventually, during that year, the learning environment was given a name–MOLÉ--which is an acronym for MSU-IIT Online Learning Environment. The usage of MOLÉ was then encouraged by the university administrators, recognizing that the system could be used by academics when they wanted it for their classes. Subsequent training workshops (at least twice a year) were conducted by this researcher with the support of the computer center personnel until 2006.

The enthusiasm to pursue the use of online learning technologies was high among early adopters of the LMS. In the early part of 2006, a comprehensive proposal was submitted by five academics, including this researcher, for the creation of a training center to formalize the training of academics in the use of MOLÉ. The proposal was approved in October 2006. The training center was called MICEL (an acronym for MSU-IIT Center for E-Learning). The proponents then became the executive management committee of MICEL, who planned for upcoming training. Thereafter, formal usage training began for basic to advanced features. Two of these proponents visited some universities that have been using LMS, including the University of the Philippines. The literature of Bandalaria (2007) gives an insight of the LMS usage in the Philippines and how they utilize the system for online learning.

Between 2007 and 2011, MICEL conducted training under the management committee with the leadership of the center director. In 2007 to 2009 this researcher was appointed to an administrative position at the School of Computer Studies, minimizing direct involvement with the training design and plans at MICEL. Nonetheless, this researcher continued working with MICEL in a consultative capacity.

Since the time MOLÉ was launched in 2002 until 2012, usage among academics had not dramatically increased. Records of computer logs (usage between June 2011-April 2012) that were collected for the duration of this study show that there are 147 academics (or 30%) who used MOLÉ. Based on computer logs collected, academics had not been consistent in their use of MOLÉ. Thus, this study was conducted to investigate why the uptake of the LMS is minimal.

1.3 Research aims

Academics at MSU-IIT are encouraged to use the learning managent system (LMS) in their classes. Despite the training and support that are provided, the uptake of LMS use is minimal. Thus, this research investigates the voluntary usage of MOLÉ by academics at MSU-IIT and aims to develop a model that can serve universities when implementing an LMS in their campuses. To achieve this aim, the study was guided and driven by the main research question:

> ***How do academics use Learning Management System in a voluntary usage context?***

Three subsidiary questions are linked to the main question:

> *What enhances academic usage of a Learning Management System?*
>
> *What inhibits academic usage of a Learning Management System?*
>
> *What measures are necessary to increase and/or improve the usage of a Learning Management System?*

This research was carried out through one-on-one in-depth interviews of academics from different academic disciplines in this university. Computer logs of these academics were also analyzed and Grounded Theory (GT) was used in the analyses of the mixed data.

A detailed description of the research approach and the methods used to address the questions above are presented in Chapter 3.

1.4 Contributions of the study

This thesis presents a model for describing the relationships of drivers and constraints in a voluntary system usage context. The qualitative interviews are accounts of what academics felt about the learning management system, and their aspirations for having a useful and beneficial tool for teaching and learning with technologies. Analysis of computer logs has furthered the understanding of academics' claims about their usage of the system. This research makes contributions to:

- a theory that voluntary system usage in a blended learning environment is influenced by drivers and constraints of the situation the users are in. A model is presented in Chapter 5 to show the drivers and constraints of academics reflecting voluntary LMS usage outcomes. The model visually explains the positive and negative influences on the perceptions of use of the LMS.
- a framework that recommends some necessary measures that can increase or improve the voluntary use of the LMS. It is important to consider that use of the LMS largely relies on what conditions academics are in. Academics' voluntary use of the system can be influenced by the socio-technological landscape of the learning environment.
- the taxonomy of academic disciplines that has a crucial influence on the voluntary usage of LMSs. This research has found that there are varied approaches to each course, and more specifically, to subject content that will best fit a blended delivery of instruction. Extending further studies in this context will benefit this area of research.

1.5 Thesis outline

This thesis consists of seven chapters, including this introduction. The following provides an overview of the thesis structure:

Chapter 2 provides the background literature, which is necessary for the basic understanding of the research context. The literature in this chapter is kept to a minimum to avoid the ingraining of any theory at the start of this investigation.

Chapter 3 describes the research approach used. The process of preparation, data collection, and analysis are explained.

Chapter 4 presents the findings from the interviews and log analysis. The five concepts and seventeen dimensions that emerged from the interview data are described. Also, the strength of usage of interactive and non-interactive features is explained.

Chapter 5 reports the analyses and theories that emerged from the data. Answers to the research questions are presented in this analytical exercise.

Chapter 6 integrates the extant literature about voluntary system usage and other underpinning concepts that helped in the development of the theory derived in this study. A comparison is made in this process.

Chapter 7 presents the theory in view of answering the research questions. This chapter provides a discussion of the implications of the derived theory in research practice, usage of educational technologies, and the concept of fitting the blended learning environment to curricular activities on individual academic disciplines. Limitations in the conduct of this study are likewise presented. Finally, this chapter highlights future areas of research that can contribute to the advancement of study in the area of voluntary system usage.

CHAPTER 2

2 REVIEW OF RELATED LITERATURE

There are two major topics that are reviewed in this chapter: system usage and the learning management system used in blended learning environments. These topics are discussed in five inter-related sections. Section 2.1 discusses system usage while section 2.2 describes the lack of theory on system usage. System use in teaching and learning is discussed in section 2.3. Section 2.4 discusses academics' use of learning management systems (LMS), while issues and challenges that impact LMS use is discussed in section 2.5. A conclusion for this chapter is discussed in section 2.6. This literature review chapter will be revisited in the literature comparison in chapter six, which integrates the findings and interpretation from this research.

2.1 System usage

A lack of theory underpins the discussion of system usage in four research domains: IS success, IS acceptance, IS implementation, and IS for decision-making (Burton-Jones and Straub, 2006). These four IS research domains have been the basis of the re-conceptualized system usage presented by Burton-Jones and Straub (2006). Each of these domains is described in section 2.1.1.

2.1.1 IS research domains

The four IS research domains are exemplified in the works of (1) Barkin and Dickson (1977) on IS for decision-making, (2) Lucas (1978) for IS implementation, (3) Davis (1989) on IS acceptance and (4) DeLone and McLean (1992) on IS success. A brief description for each of the four research domains is essential. Each domain is explained in the subsequent sections. Understanding the differences and relationships of each domain of IS research is important at this stage to be informed of what needs to be constituted with system usage which is explained later in section 2.1.2 onwards. In all of these areas of research, the importance of defining system usage is highly relevant. Burton-Jones and Straub (2006) argued that "despite this long standing investigation of system usage, studies of its relationship with other constructs often report weak effects" (p. 3). An illustration of a high-level conceptualization of system usage adapted from Burton-Jones and Straub (2006) is presented for each domain.

IS for decision-making

In this research domain, system usage is depicted as primarily a dependent variable (DV) (Burton-Jones & Straub, 2006), as shown in Figure 2.1. IS characteristics are studied to find out whether these characteristics improve decision-making. This relationship is shown in the Barkin and Dickson's (1977) model.

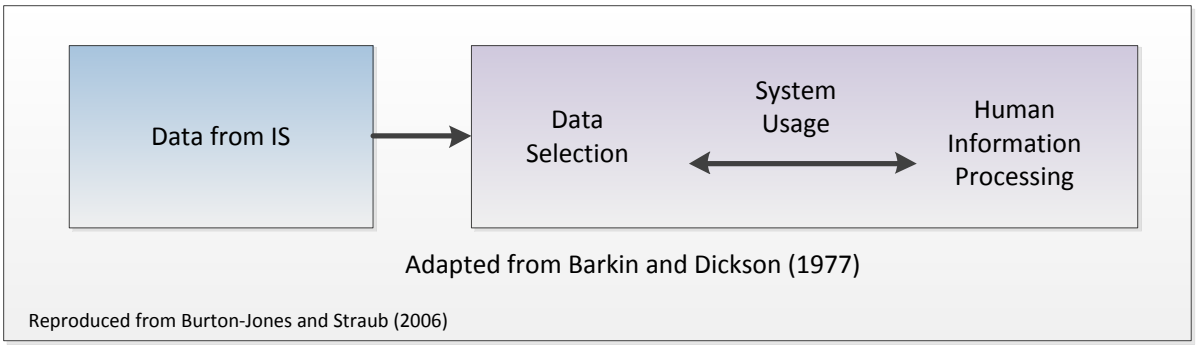


Figure 2-1: IS for Decision-Making

The relationship of the data selection system to the Human Information Processing System was investigated in the study of Barkin and Dickson (1977). Specifically, Barkin and Dickson (1977) were interested in whether cognitive style has an effect on a user when selecting data. An experiment was designed for this study about utilization of the system. In that study, utilization was defined as: "an information system is utilized if the output from the information system is included in the Human Information Processing system of a decision-maker" (Barkin & Dickson, p.35). Measuring data selection was done by the participants by using a highlighting pen on the specific data elements in a report provided. Results indicated that there is a strong relationship between cognitive style and data selection. This notion is conformed in Szajna (1993), where she argues "when measuring IS usage, it would be wise to include a measure of the users' perceptions" (p.153).

IS implementation

In *IS implementation*, research system usage is a key DV. That is, it determines the characteristics of IT implementation that leads to greater use of the final system (Burton-Jones & Straub, 2006). This is illustrated in Figure 2-2.

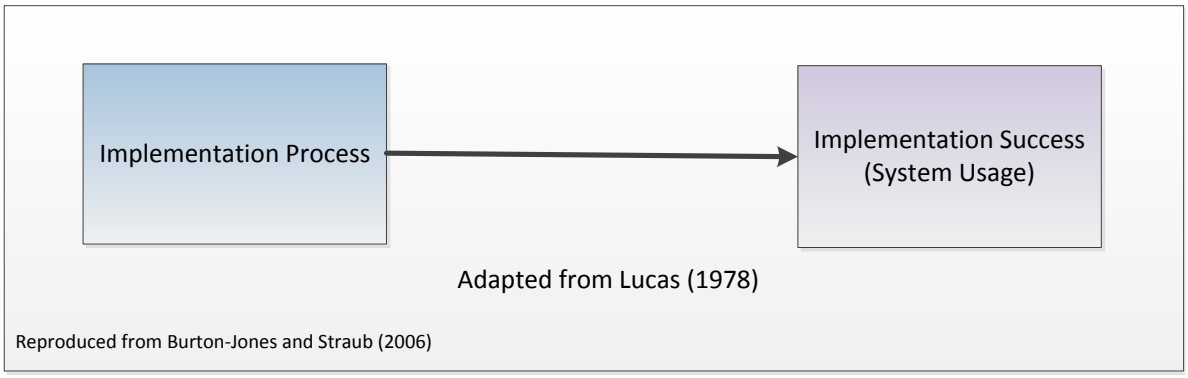


Figure 2-2: IS Implementation

In Lucas (1978), a model was presented, which identified the factors that are associated with the successful implementation of a computer-based information system. User attitude and system quality have been found to correlate with the success of system implementation. Further studies were suggested to find evidence that management support and the characteristics of the system relate with the attitude and perception of system use (Lucas, 1978). Although not specifically gauged, Lucas (1978) contended that the use of the system is a good indicator of implementation success when use is voluntary. However, Szajna (1993) asserted that in instances that an organization has a voluntary usage policy, the decision to use the system may not be at the user's discretion when no alternative system is available, or when political/social influences exist.

IS acceptance

Researchers typically investigate system usage as a behavior determined by social and cognitive variables in the *IS acceptance* domain (Burton-Jones & Straub, 2006). The goal is to find variables that explain most variance in usage. Three theories are employed to specify the range of antecedents, which include: the theory of reasoned action, theory of planned behavior, and social learning theory. Also, Roger's diffusion model is included in this discussion.

IS acceptance is modelled in the Technology Acceptance Model (TAM) put forward by Davis (1989) as depicted in Figure 2-3. TAM theorizes that an individual's behavioural intention to use a system is determined by two beliefs: perceived usefulness and perceived ease of use (Venkatesh & Davis, 2000). Venkatesh and Davis (2000) differentiated the two beliefs by defining perceived usefulness as the extent to which a person believes that using

the system will enhance his or her job performance. In contrast, perceived ease of use is the extent to which a person believes that using the system will be free of effort. From past

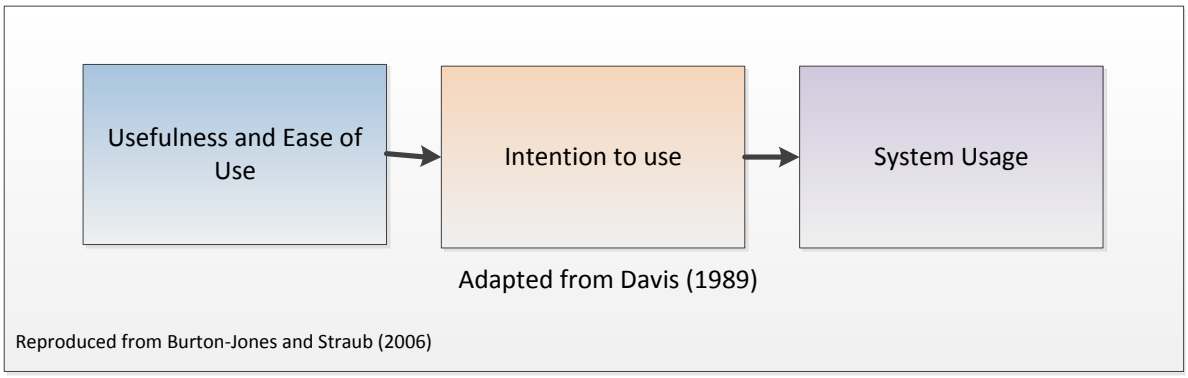


Figure 2-3: IS Acceptance

studies there were determinants that were overlooked in TAM. Hence, Venkatesh and Davis improved and extended the original version, producing TAM2 (Venkatesh & Davies, 1996; Venkatesh & Davis, 2000). In TAM2, subjective norm was found to have a "significant effect on usage intentions over and above perceived usefulness and perceived ease of use for mandatory (but not voluntary) systems (Venkatesh & Davis, 2000, p. 198). TAM2 has progressed to another model – the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, and Davis, 2003). The Unified Theory of Acceptance and Use of Technology (UTAUT) model is composed of four core determinants of intention and usage: (1) performance expectancy, (2) effort expectancy, (3) social influence, and (4) facilitating conditions), and four moderators of key relationships: (1) gender, (2) age, (3) experience, and (4) voluntariness of use (Venkatesh et al.,2003).

The relatedness of human behaviour research (e.g. how technology is accepted) by individuals and organizations can be characterized with the applicability of Roger's diffusion model. Rogers (2004) recalled in her article 'A Prospective and Retrospective Look at the Diffusion Model' "that diffusion was a general process, not bound by the type of innovation studied, by who the adopters were, or by place or culture. I was convinced that the diffusion of innovations was a kind of universal micro-process of social change." (p.16). Discussing IS acceptance is associated with Roger's diffusion of innovation research. For example, Agarwal and Prasad (1997) conform to the notion that innovation diffusion research, postulates that many different outcomes are of interest in technology adoption, including the initial decision to use the system and the continued or sustained use of the innovation. This is the same agenda that Moore and Benbasat (1991) had supported – adoption of technology.

There are seven perceived characteristics of using an innovation, together with the perception of voluntariness (Moore & Benbasat, 1991). These are: voluntariness, image, relative advantage, compatibility, ease of use, observability, and triablity.

The relationship of perception to decision to adopt or reject are explained in Agarwal and Prasad (1997). They contend that according to innovation diffusion research, individuals gather and synthesize information about the innovation; this information processing results in the formation of perceptions about the innovation. Furthermore, based on these perceptions, a decision is made to adopt or reject the innovation. Innovation diffusion research thus specifically recognizes that institutionalization of a behavior is different from, and perhaps more important than, its initial manifestation (Agarwal & Prasad, 1997). Moreover, Agarwal and Prasad (1992) explained that users may be persuaded to use a new system early in the implementation process but the benefits from system usage may never be derived in the absence of continued, sustained usage.

IS success

Researchers have measured usage as an independent variable (IV) or mediating variable in the IS success domain (Burton-Jones & Straub, 2006). This is modelled in Figure 2-4 which DeLone and McLean (1992) asserted that by measuring usage, this leads to downstream impacts in order to determine how IT benefits individuals or organizations.

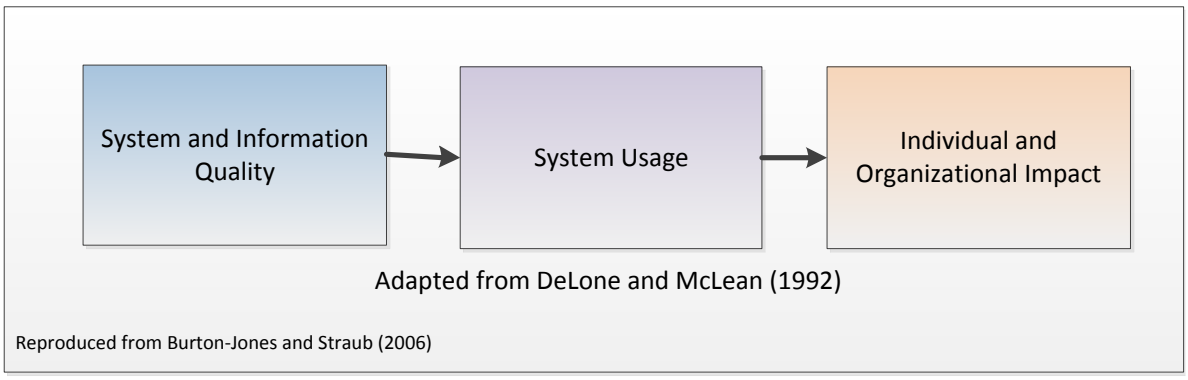


Figure 2-4: IS Success

IS success model is defined in the DeLone and McLean IS Success Model (DeLone & McLean, 1992; henceforth D&M) to have six dimensions of IS success: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. DeLone and McLean (2003, p.9) asserted that "after ten years the D&M IS Success Model is

still valid". Urbach, Simolnik, and Riempp (2009) opined that "D&M became one of the dominant evaluation frameworks in IS research because of its understandability and simplicity (Urbach & Muller, 2012, p. 3). An updated IS success model (DeLone & McLean, 2003) was proposed ten years after the first model was published. This updated model consists of six inter-related dimensions of IS success, namely: information system, service quality, (intention to) use, user satisfaction, and net benefits. Evidently, the new D&M IS success model (DeLone & MacLean, 2003) is still having a problem on lack of theory given the persistent "mixed results and lack of consensus on how to conceptualize system usage in IS success models" (Burton-Jones & Straub, 2006, p. 4).

Given the brief background of each model, a basic understanding of what is needed for a specific IS research undertaking is gleaned sufficient at this stage. For this research on voluntary use of LMS, two models are relevant: – IS acceptance model and D&M success model.

2.1.2 **Relevance of system usage research domains to thesis**

Of these four IS research domains, Burton-Jones and Straub, (2006) argued that there is a lack of theory on system usage. Moreover, they contended that while researchers choose measures that are specific to their research domain, similar usage measures are generally deployed. However, "[l]ong-standing measures include: features used, tasks supported, extent of use, use or non-use, heavy/light use, frequency of use, and duration (Burton-Jones and Straub, 2006, p.3).

Doll and Torkzadeh (1998) argued the importance of measuring system usage. They developed an instrument for usage measures to gauge the extent of information technology utilization in an organizational context. The instruments that they developed were proposed to evaluate how extensively systems are used by individuals to perform certain organizationally-relevant functions. Systems may be used in limited ways due to narrowly specialized jobs, user resistance, poor training, or a lack of employee empowerment (Doll and Torkzadeh, 1998). They claimed that despite this limitation, these measures of system-use in an organizational context can provide an important new research tool. These measures are appropriate to use when investigating the impact of information technology (Doll and Torkzadeh, 1998). Patterns and extent of system use in different dimensions in organizations can be investigated, which is one of the advantages of measuring system use. Patterns can

also be investigated in the context of whether the use of the system is voluntary or required (Doll & Torkzadeh, 1998).

Although the argument of Burton-Jones and Straub (2006) is largely useful in this study, a more specific context on the lack of theory in one of its measures – i.e., voluntary system usage needs to be theorized. It is essential at this point to understand the lack of theory on system usage to provide a better insight about voluntary system usage. The next section discusses this point.

2.2 The lack of theory on system usage

There are two issues relating to the lack of theory on system usage: (1) there is no widely accepted definition of system usage, and (2) there are diverse sets of unsystematized measures that are used in IS research. This means that there is no accepted approach for selecting the relevant content of usage for any given study context (Burton-Jones and Straub, 2006). Thus, there was a need to re-conceptualize system usage because there was no strong theoretical basis for system usage that were empirically tested and had related system usage to other constructs (Burton-Jones & Straub, 2006). A two-staged approach was conceived: (1) *defining system usage*, and (2) *selecting usage measures* (Burton-Jones and Straub, 2006).

As argued by Burton-Jones and Strauss (2006), the definition stage should involve defining the distinguishing characteristics of system usage and stating assumptions regarding these characteristics. System usage is defined as:

> an activity that involves three elements (1) a user, i.e., the subject using the IS, (2) a system, i.e., the object being used, and (3) a task, i.e., the function being performed (Burton-Jones & Straub, 2006, p. 6).

Burton-Jones and Straub (2006) explained further that the *user* is an individual who employs an *IS* in his/her tasks, and, in this case, user behavior can be possibly studied at the individual level. The *IS* is explained as an artifact that has features that allow the user to accomplish the tasks. The *task* is the goal-directed activity performed by the user where the task outputs can be assessed.

In the second stage, it is necessary to select the usage measures and, at this stage, the best measures for the part of the usage activity that is of interest must be chosen (Burton-Jones and Straub 2006). There are two steps involved in this stage: *structure* and *function*. In the structure step, elements of usage that are most relevant for the research model and context

have to be selected. Significantly, researchers are advised to explain underlying assumptions. In the function step, it is necessary to select the measures of the chosen elements that tie to the other constructs in the nomological network (Burton-Jones and Straub, 2006).

2.2.1 The two-stage approach to IS usage research

By applying the two-stage approach to IS usage research, researchers have to focus on using a ”very rich” measure that captures all three elements (user, system, and task) of the definition (Burton-Jones & Straub, 2006). A rich level of measure of usage is the “extent to which the user employs the system to carry out the task” (Burton-Jones and Staub, 2006, p.8). To deepen the understanding of this measure, a table of rich and lean measures is presented in Table 2-1.

Table 2-1: Rich and Lean Measures of System Usage

(Adapted from Burton-Jones and Straub, 2006, p. 8)

Richness of measures	Type of use	Domain of Content		
		Usage		
1. Very Lean	Presence of use			
2. Lean	Extent of use (omnibus)			
3. Somewhat Rich (IS)	Extent to which the system is used	System	User	Task
4. Rich (IS, User)	Extent to which the user employs the system	System	User	Task
5. Rich (IS, Task)	Extent to which the system is used to carry out the task	System	User	Task
6.Very Rich (IS, User, Task)	Extent to which the user employs the system to carry out the task	System	User	Task

Table 2-1 identifies the three important elements identified (Burton-Jones and Straub, 2006) (system, user, task) that have to be included when defining system usage. Measuring system usage is a relevant component in investigating the voluntary context of this study because what this research is looking into is the impact to the user of the system when performing the task. Thus, by considering the factors that affect voluntary system usage, it may be feasible to determine which factor has a greater impact to system usage.

Some IS research investigated the triad of user, system, and task; however, these studies did not specifically deal with defining system usage (e.g.Wang & Wang, 2009; Selim, 2007; Islam, 2012).

Wang and Wang (2009) investigated the factors that could explain and predict the instructor adoption of web-based learning systems. The authors developed an integrated model of adoption of web-based learning systems, incorporating user intention/behavior, information system success and psychology constructs. There were 268 instructors who participated in this study. Survey data were examined using structural equation modeling to verify the proposed theoretical model. The results of this study indicated the relationships of system quality, service quality, and self-efficacy to instructor adoption of web-based learning systems in higher education. These constructs are found to increase perceived ease of use, where service quality contributes more to perceived ease of use compared to the other two variables. The authors argued the importance of effective and timely support to assist instructors in using web-based learning systems. They claimed that system quality, which can be measured by factors including the design of user interface and the usefulness of the functions provided, may influence perceived ease of use. Among the constructs investigated, system usage was of interest to that research. However, system usage was not defined and the measures on system usage were not factored to include voluntary usage in that study.

The study of Selim (2007) studied the critical success factors (CSF) for e-learning acceptance as perceived by university students. Selim (2007) focused on four categories: instructor, student, information technology, and university support. In that study, categorization was tested by surveying 538 university students. The results of Selim's (2007) study revealed eight categories of e-learning critical success factors. These are: instructor characteristics (attitude towards and control of the technology, and teaching style), student characteristics

(computer competency, interactive collaboration, and e-learning course content and design), technology (ease of access and infrastructure), and support. Selim (2007) concluded that the eight CSF categories impact the decision to adopt e-learning technology in higher education institutions.

Islam (2012) examined the role of perceived system quality as motivation to continue e-learning system use among educators. Islam (2012) proposed a model that was tested among 175 university educators who had used Moodle. Results of the study revealed that perceived usefulness, confirmation of initial expectations, and perceived system quality significantly affected educators' satisfaction. Moreover, results indicated that perceived usefulness and satisfaction significantly affected continuance intention. However, the study showed that there was no direct association between perceived system quality and continuance intention. In conclusion, Islam (2012) acknowledged that usage behavior is dynamic and changes over time due to changes in cognition as the users became experienced with the target system. These changes in cognition and attitude cannot be captured in a cross-sectional study. It was suggested that a longitudinal design would capture such changes and provide deeper insights into how changes in user cognition influence usage behaviour.

The triad of system, user, and task has been included in the studies of Wang and Wang (2009), Selim (2007), and Islam (2012). However, the contexts of these studies were focussed on decision to adopt, and continuance intentions. Per suggestion of Burton-Jones and Straub (2006), it is surmised that defining and measuring system usage is confined to the context of the user. The decision to use or the levels of acceptance of the system depends on the benefit he/she acquires when using the features of the system to perform his/her tasks. However, this notion of usage measures which is based on the benefits acquired is a challenge for a voluntary system use situation.

There are two sets of contexts of usage that this research has identified to have gaps in research. These measures could be relevant to theorizing the voluntary system usage measure: (1) actual and perceived usage and (1) actual and self-reported usage. Studies that relate to these themes are discussed further below. Further questions to what constitutes academics' voluntary usage of an LMS are raised in this research: apart from the system and task, are there other factors that affect a user when using the system? How then can voluntary usage be gauged? These questions are related to the questions stated in Chapter 1 of this thesis: how do academics use the learning management system in a voluntary context?

2.2.2 **Relating studies to voluntary system usage**

Considering literature that could relate to actual, perceived, and self-reported usage are relevant to this review on voluntary usage. Some studies were identified and described to be useful for voluntary LMS usage. These studies which are discussed next, are mostly related to the D&M IS success model (DeLone & McLean, 2003) and UTAUT model (Venkatesh et al., 2003). The dimensions of use and user satisfaction in relation with intention to use, frequency of use, self-reported use, and actual use have relevance to this study.

In one of the literature, Petter, DeLone and McLean (2008) examined empirical studies that used the D&M IS success model (DeLone & McLean, 2003) from 1997 to 2007. The six dimensions of the D&M model – *system quality, information quality, service quality, use, user satisfaction, and net benefits* were used in the Petter et al. (2008) study where success of IS usage among individuals and organizations were reviewed. Petter et al. (2008) claimed that they have considered many different types of IS under a variety of conditions. Furthermore, they said that the empirical studies had reasonable support for the majority of relationships within the model, suggesting the value of the D&M model of IS success when evaluating utilitarian IS. Petter et al. (2008) recognized that different measures could potentially lead to mixed results between *use* and other constructs in the D&M model. Likewise, there is a tendency of heavy users to underestimate use, while light users have the tendency to over estimate use. Moreover, they suggested that self-reported usage may be a poor surrogate for actual use of a system (Petter et al. 2008). Although Petter et al. (2008) have reviewed 90 empirical studies related to the history of IS success in different sectors (i.e., in business, government, industry), there was only a single study (Chiu, Chiu, & Chang, 2007) related to the use of LMS that was included in their examined literature.

The study of Chiu et al. (2007) was considered because it belongs to the e-learning study context. However, the participants were students and the theme was not on voluntary usage. Chiu et al. (2007) examined the integrated influence of fairness and quality on learners' satisfaction and Web-based learning continuance intention and argued that the success of Web-based learning depends largely on user satisfaction and other factors that eventually increase users' intentions to continue using the service (continuance intention).

Measuring the usage of an IS is a broad concept and can be considered from several perspectives including voluntary use (Urbach & Muller, 2012). Urbach and Muller (2012, p.7) stated that "[i]n case of voluntary use, the actual use of an IS may be an appropriate

success measure". In relation to *user satisfaction*, they contended that "[m]easuring user satisfaction becomes especially useful, when the use of an IS is mandatory and the amount of use is not an appropriate indicator of systems success". The *user satisfaction* dimension is described as the user's level of satisfaction when utilizing an IS (Urbach & Muller, 2012).

Actual and self-reported usage is another dimension that appears to have research gaps. In Venkatesh, Morris, Davis, and Davis (2003), they looked into another dimension relating to actual usage and found a significant relationship between intention to use and actual usage. Although frequency of use is one indication of actual usage, it may not be the best way to measure IS use (Venkatesh et al. 2003). Doll and Torkzadeh (1998) had earlier identified this discrepancy and argued that more use is not always better. The discrepancies on actual and reported usage had led to the development of the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003)

Arising from the studies of Burton-Jones and Struab (2006), Venkatesh et al. (2003), and DeLone and McLean (2003), the perspective of voluntary use of information systems is viewed as an essential component in system use research. However, there has been no study yet that reported about theorizing voluntary system usage. In addition, there is no study that defines voluntary system usage in the context of blended learning environment. Hence, these gaps in research are being considered in this thesis. This limitation on a defined voluntary system usage compels this review to relate studies on user satisfaction. Some studies that exemplified user satisfaction include Al-Busaidi and Al-Shihi (2012), Bolliger and Wasilik (2009) and Yengin, Karahoca and Karahoca (2011), while a study of Sridharan, Deng, and Corbitt (2010) evaluated the critical success factors for sustainable e-learning. These studies are detailed next.

Al-Busaidi and Al-Shihi (2012) investigated the key factors to instructors' satisfaction of learning management systems, and how this satisfaction is related to instructors' intention to continuously use LMS in blended learning and purely for distance education. Eighty two instructors participated and answered an electronic questionnaire. Results of the study indicated the key factors that are related to instructors' individual characteristics (computer anxiety, technology experience and personal innovativeness), LMS characteristics (system quality, information quality and service quality), and organizational characteristics (management support, incentives policy and training). Al-Busaidi and Al-Shihi (2012) emphasized that instructors' satisfaction is a significant determinant of their continuous

intention to use LMS in blended learning, and their intention to purely use LMS for distance education.

In a similar study, Bolliger and Wasilik (2009) examined the factors influencing faculty satisfaction with online teaching and learning in higher education. The authors believed that faculty satisfaction is considered an important factor of quality in online courses. An online faculty satisfaction survey (OFSS) was developed and administered to all instructors who had taught an online course at a small research university. There were 102 individuals who completed the web-based questionnaire. Results of the study confirmed that three factors affect satisfaction of faculty in an online environment: student-related, instructor-related, and institution-related factors.

Yengin et al. (2011) studied an e-learning success model for instructors' satisfactions in the perspective of interaction and usability outcomes. The authors believed that e-learning approaches could be handled in a system design view, and in which the system components and factors have critical roles in order to assure success of IS usage among instructors. In the Yengin et al. (2011) study, factors related to instructors' satisfaction in e-learning systems have been identified. This led them to develop a basic model which they called "E-Learning Success Model for Instructors' Satisfactions" which is related to social, intellectual and technical interactions of instructors in whole e-learning system.

A study of Sridharan et al. (2010) evaluated the critical success factors for sustainable e-learning in an e-learning ecosystem framework. Three critical components of the e-learning ecosystem were considered which include: principles and methods, processes and systems, and substance and content. Comprehensive literature reviews and systematic interviews were conducted with experts in e-learning to identify the critical success factors to sustainable e-learning in this study context. In that study, the authors developed an e-learning success model that described the underlying relationship between and among the identified critical success factors. Findings indicated that there are several barriers to the effective adoption of the proposed e-learning success model for improving the effectiveness of elearning. These barriers include a lack of understanding of the technologies behind various pedagogies, insufficiencies of the popular learning management systems, and the sustainability of the learning objects repositories (Sridharan et al., 2010).

The notion of voluntary usage has not been investigated in the studies above. Likewise, there have been no actual measures done, although perceived and self-reported usage of the system

was evident from the surveys (e.g., Al-Busaidi & Al-Shihi, 2012 and Bolliger & Wasilik, 2009). However in Yengin et al., (2011), a model was developed based on a review of existing literature, while the study of Sridharan, et al. (2010) was a comprehensive investigation using extensive literature reviews and systematic interviews. Nevertheless, what is evident in these studies is that user satisfaction and critical success factors of e-learning environments are essential research themes that are significant in this investigation. They are also relevant to measuring system usage.

The relevance of measuring system usage is apparent in one of the conclusions of DeLone and McLean (2003) which states that:

> With the growth of management support systems and the advent and development of e-commerce systems, voluntary systems use is more common today than it was a decade ago. We, therefore continue to advocate the inclusion of "System Use" as a critical dimension of IS success measurement. Actual use measures should be preferred to self-reported use measures. Also, usage measures should capture the richness of use as a system phenomenon including the nature, level, and appropriateness of use, and should not simply measure the frequency of use (p. 27-28).

The DeLone and McLean (2003) conclusion stated above gives this thesis a more specific outlook about voluntary system use. In this thesis' context, the use of the learning management system (i.e., MOLÉ) at MSU IIT is on a voluntary basis. There is no mandate that requires academics to use the system in their classes. Furthermore, classes are officially held in the traditional mode. The view of the university administration is to provide the basic infrastructure that will keep the academic community abreast with technological developments including the use of the learning management system.

From the definition and selection contexts of Burton-Jones and Straub (2006), this research proposes to develop a theory of voluntary system usage. The works of DeLone and McLean (2003), and Venkatesh et al. (2003), which deal with system use, are relevant to this study and will also be revisited in the comparison of literature in chapter 6.

2.3 System use in teaching and learning

Learning is exhibited by a change in behavior which can be manifested by comparing the learner's behaviour before and after treatment (Gagne, 1985). Such manifestations can be facilitated by systems, and the teaching and learning mechanisms. These mechanisms could be differentiated by our understanding of different learning environment (LE) models.

There are three basic LE models: traditional or face-to-face mode, purely online or totally web-based mode, and blended or mixed/hybrid mode. All of these LE models can be enhanced with the support of computer technology. However, there are issues related to learning that figure prominently in technology-enhanced LEs. The acquisition of knowledge and skills, the formation of mental structures, and the processing of information and beliefs are stressed in cognitive theories (Schunk 2008). More importantly, cognitive theories emphasize the role of learners' thoughts, beliefs, attitudes, and values. Although this research will not discuss cognitive theories in depth, a basic understanding is necessary.

Cognitive theories acknowledge the role of environmental conditions as an influence on learning (Agarwal & Karahanna, 2000; Lameras, Levy, Paraskakis & Webber, 2012; Agarwal, R. &Prasad, 1997). Such conditions may include teachers' explanations and demonstrations of concepts, whether in a traditional, purely online, or blended environment (Anderson & Dron, 2010). However, there may be constraints that teachers (academics) have when web-enhanced learning platforms are used, from preparation of instructional contents to facilitation of discussions and discourses using web technologies, and evaluation of learning performance of students (Carter, Ala-Mutka,Fuller, Dick, English, Fone & Sheard, 2003; Aggarwal, Lynn, 2012).

Computer-based technologies are central to the teaching and learning processes for purely online and blended learning environments. The conduct of classes in a purely online learning environment happens in virtual learning spaces. Thus, teachers and students do not meet face-to-face (Graham, 2006). In a blended learning environment, traditional classes are complemented with learning resources that are accessible online. Collectively, when learning resources are accessed using computer-based technologies, the teaching and learning process is commonly called e-learning or learning online (Morgan, 2003 andVrasidas, 2004). In e-learning, the distribution and delivery of courses and instructional materials are managed by software applications, more specifically, with a learning management system (LMS) that are developed by corporate software players. The use of LMS in e-learning studies is a common research agenda (Wallace, 2003). The next sub-section introduces some of the common LMSs used by education and training organizations.

2.3.1 **Learning Management Systems (LMS)**

The most common functional description of a learning management system is its primary use for online or blended learning. The functions of these systems include supporting the

placement of course materials online, associating students with courses, tracking student performance, storing student submissions and mediating communication between the students as well as their instructor (Watson & Watson, 2007). Watson and Watson (2007) characterized LMS as having a 'systemic nature' (p. 28). It is the framework that handles all aspects of the learning process, such that it delivers and manages instructional content apart from tracking and reporting, analyzing skills gap, and handling course registration and administration (Szabo, 2002).

Early beginnings of LMS

Early beginning of the LMS can be traced back to the time that it was called computer-based integrated learning systems (ILS) (Becker & Hativa, 1994). Historical accounts reportedly started with special-purpose electro-mechanical 'teaching machines' in the early 19th century (Becker & Hativa, 1994). Then two systems known as PLATO (Programmed Logic for Automatic Teaching Operators) and TICCIT (Time-shared, Interactive, Computer-Controlled, Information Television) were developed in 1960 and early 1970s at the University of Illinois and in two private U.S. corporations. The PLATO system is a large educational and computing network based at the University of Illinois that supports nearly 1,000 terminals at dispersed locations and provides each site with access to a central library of lessons. On the other hand, the TICCIT system supports small, local instructional computing facilities. In the TICCIT system, lessons are displayed on a color-television screen connected to the student's keyboard and a local computer. One TICCIT system can serve 128 terminals (Kulik, Kulik & Cohen, 1980).

Studies in the 1980s up to these days are similar where effectiveness of learning systems is being researched. Becker and Hativa (1994) described ILS as "software systems across computer networks that provide a comprehensive, multi-year collection of computer-assisted-instruction, delivered primarily through a model of individual assessment and task-assignment, and which record and report student achievement data" (p. 9). In addition, ILSs provide educators with an instructional delivery system for integrating academic skills, remediation and enrichment opportunities with the school district curriculum using a strategy of individualized instruction. One of the principal features of an ILS is a management system that continuously monitors individual learner and class performance, and provides diagnostic and prescriptive information for learners based on individual progress and performance Becker and Hativa (1994).

Relating the term LMS to the history of ILS is a practical introduction of the origins of the system term at this stage. Calling LMS as a learning management system is assumed here as having been derived from the earlier description of ILS. Watson and Watson (2007) wrote:

> The term ILS was coined by Jostens Learning, and LMS was originally used to describe the management system component of the PLATO K-12 learning system, content-free and separate from the courseware (R. Foshay, personal communication, October 24, 2006). The term LMS is currently used to describe a number of different educational computer applications, and we would argue that it is often used incorrectly (p. 28).

Nevertheless, the relevance of the LMS considered in this research is how it was used by academics. Some examples of LMS are Blackboard, Angel, WebCT, Sakai and Moodle, among others. These systems are described below.

Blackboard

Blackboard Learning System, which was originally established in 1997, is a virtual learning environment that is licensed to colleges and other institutions and used in many K-12, and professional education institutions for e-learning (Blackboard, 2014). Blackboard Inc., the developer of the learning system, is a private company, which has merged into its operation with other learning platforms like Angel and WebCT. Angel LMS evolved from research at Indiana University-Purdue University Indianapolis (IUPUI). The initial research system deployed in 1996 became Indiana University's OnCourse. On the other hand, WebCT was originally developed at the University of British Columbia (UBC) by a faculty member in computer science named Murray Goldberg.

Research was conducted by Goldberg about the application of web-based systems to education. Goldberg's research showed that student satisfaction and academic performance could be improved through the use of a web-based educational resource, or web-based course tools – from which the name WebCT was derived (Goldberg, Salari & Swoboda, 1996). Goldberg's research led to the first version of WebCT in early 1996, which was first presented at the 5th international World Wide Web conference in Paris during the spring of 1996. In 1997, Goldberg created a company, WebCT Educational Technologies Corporation, which was a spinoff company of UBC. Now, the merger of these learning environments is called Blackboard Learning System (Blackboard, 2011).

Sakai

Sakai (Sakai, 2014) is a community of academic institutions, commercial organizations and individuals who worked together to develop a common Collaboration and Learning Environment (CLE). In its website, Sakai CLE is described as a free, community source, educational software platform distributed under the Educational Community License (a type of open source license). The Sakai CLE is used for teaching, research and collaboration.

The Sakai software includes many of the features common to course management systems, including document distribution, a gradebook, discussion, live chat, assignment uploads, and online testing. In addition to the course management features, Sakai is intended as a collaborative tool for research and group projects. To support this function, Sakai includes the ability to change the settings of all the tools based on roles, changing what the system permits different users to do with each tool. It also includes a wiki, mailing list distribution and archiving, and an RSS reader. The core tools can be augmented with tools designed for a particular application of Sakai. Examples might include sites for collaborative projects, teaching and portfolios (Sakai, 2014).

The development of the Sakai CLE was originally funded by a grant from the Mellon Foundation as the Sakai Project (Sakai, 2014). The early versions of the software were based on existing tools created by the founding institutions: Indiana University (Oncourse), Massachusetts Institute of Technology (Stellar), Stanford University (CourseWork), University of Michigan (CTools, formerly CourseTools, based on the CHEF framework), uPortal and the Open Knowledge Initiative (Sakai, 2014). Development work of Sakai is currently supported by community members (resources provided by academic institutions and commercial affiliates as well as individual volunteers) and the Sakai Foundation (Sakai, 2014).

Moodle

Moodle is described in its website as a learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalised learning environments (Moodle, 2014). Moodle is also described as freely open source software, under the GNU General Public License. Anyone can adapt, extend or modify Moodle for both commercial and non-commercial projects without any licensing fees and benefit from the cost-efficiencies, flexibility and other advantages of using Moodle. Moodle is built by the Moodle project which is led and coordinated by Moodle HQ, an

Australian company of 30 developers which is financially supported by a network of about 60 Moodle Partner service companies worldwide (Moodle, 2014).

A historical account is presented in the company's website informing that Moodle was founded by its lead developer - Martin Dougiamas, who took lessons from the School of the Air, giving him from a young age an insight into distance learning (Moodle, 2014). The name Moodle was a choice of Martin, which he wrote in his personal website, stating that when he was coming up with a name for his system he has four requirements: (1) was an acronym (emphasizing that he like hidden meanings); (2) was a word that one could say easily; (3) was not common on the internet (so searches could find it); and (4) had a domain name free. He explained:

I played around with words and whois for a few hours before finally deciding on Moodle and registered moodle.com. The fact that "moodle" actually had a meaning of its own which made sense was the main reason why it won over other combinations. The system has never had another name, although originally the M in Moodle was "Martin's" not "Modular" (Lounge: Martin Doguiamas, Sunday, 17 July 2005, 11:26 PM). Later, his experiences during his research studies and work, in which WebCT was being used in his university (Curtin), prompted him to investigate an alternative method of online teaching (Moodle, 2014). Dougiamas' research has maintained his philosophical views that the design and development of Moodle is guided by a "social constructionist pedagogy" (Moodle, 2014). Social constructivism and social constructionism are theoretical perspectives related to research in online learning (Doguiamas & Taylor, 2002). Some studies that dealt with Moodle usage consider social constructivism as essential concepts in their blended environments (Chao, 2007; Humbert, 2007; Lane, 2008; Mihailescu, 2009; Stewart, Briton, Gismondi, Heller, Kennepohl, McGreal, Nelson, 2007).

The first version of Moodle (Moodle 1.0) was released in August 2002. Development of Moodle has been consistent through the years. Moodle has established itself by 2007 as a leading and award-winning open source LMS. In November 2010, Moodle 2.0 was released. Regular subsequent releases bring enhanced features of the system every six months. The LMS, which was originally for classrooms, has expanded, such that the current platform being developed is for mobile technology. An official HTML5 app was released in 2013 and the latest version of Moodle includes a customizable theme suitable for all screen sizes (Moodle, 2014). Some literature assess Moodle and its capabilities as a useful tool in learning and networking (e.g., Al-Ajlan, Zedan, 2008; Chao, 2008).

2.3.2 **The role of LMS in blended learning environments**

The descriptions about various LMSs are already sufficient to say that these learning environment platforms play a big role in teaching and learning using technologies online, in the classrooms or while mobile. Deploying courses online means either pure Internet-based delivery (or pure online learning), or a combined use of Internet technology and the traditional face-to-face delivery of instruction (or blended learning) with the use of an LMS. Occasionally, the terms 'hybrid mode' or 'mixed mode' are used for blended mode, however, these terms are basically the same. A common definition of blended learning is the integration or combination of instruction from two historically separate models of teaching and learning: traditional face-to-face learning systems and distributed learning systems (Graham, 2006). The term hybrid mode is retained when it is literally used by the participant in this current research.

LMS usage for teaching, learning, and training are common themes being studied in education and training sectors (Rubin, Fernandes, Avgerinou, & Moore, 2010; Selwyn, 2007; Vovides, Sanchez-Alonso, Mitropoulou, & Nickmans, 2007). In the context of this research, discussions are focused on the use of the blended learning environments in higher education using Moodle. The basic feature of this learning environment is its deployment through the World Wide Web (WWW). Hence the training, teaching, and learning materials are accessible anytime, anywhere (Black, Beck, Dawson, Jinks, & DiPietro, 2007). Typically, the learning environment is embedded in the institution's web portal, which academics can use to facilitate in the teaching and learning process. Quizzes and assignments can be uploaded in the system. Assessments, like grades and performance details, can be accessed in the system. Moreover, interaction and communication with the participants (teachers, students, and peers) in the learning environment is possible in either the synchronous (e.g., chat) or asynchronous mode (e.g., discussion forums and email) Petropoulou, Altanis, Retalis, Nicolaou, Kannas, Vasiliadou, & Pattis 2010; Weaver, Spratt, Nair, Chenicheri 2008; Walsh, 2013). An online learning environment has the same teaching and learning mechanisms with that of a traditional environment except for some features, making the online environment more complex and unique.

The educational context in both traditional and online environments requires that learners' needs are assessed, content is negotiated or prescribed, learning activities are orchestrated, and learning is assessed (Anderson, 2003; Anderson, 2008). A summary of the differentiation

by Anderson (2008) of the online learning environment with additional features from the traditional setting includes (1) the capacity for shifting the time and place of the educational interaction; (2) the ability to support content encapsulated in multimedia formats; (3) the capacity of the WWW to access huge repositories of content on varied subjects of interest - including content made by the teacher and students – resources that are only available in major research libraries; and (4) the capacity to support human and computer interaction in different media formats in both asynchronous and synchronous modalities – creating a communication-rich learning context.

2.3.3 **Various studies on LMS use**

Different themes suggest that LMS use has been researched on various aspects of IS research domains, such as adoption (Lust, Juarez Collazo, Elen, & Clarebout, 2012; Steel and Levy, 2009; Arbaugh and Hwang, 2013) implementation (Dzemydiene, & Tankelevičiene, 2009); Vrasidas, 2004), decision making (Cavus & Momani, 2009 & Chao, 2008) , and LMS success (Baker, Barnes, & Beck, 2008 andGraven, Helland & MacKinnon 2006, Lee-Post 2009) . However, there were only a few studies found on mandated and voluntary use of web-enhanced or purely online learning platform. Further, the participants in these studies are students. Some studies relating to the four research domains using the LMS are discussed next.

Lee (2006) carried out an investigation of the factors affecting the adoption of e-Learning systems (ELS) by students in mandatory and voluntary settings based on an extension of TAM. The results implied that mandatory usage is necessary for overall adoption of the ELS among students. ELS should be developed to target changes in perceived usefulness, perceived ease of use, and perceived network externality (Lee, 2006).

Another study (McGill & Klobas, 2009) investigated the role of task–technology fit in LMS success, and addressed the question of how task–technology fit influenced the student performance impacts of LMSs. Results of the study showed that task–technology fit have a significant positive effect on attitude towards LMS use. In this study of McGill and Klobas (2009) study, students believed that they had little choice on whether to use the LMS or not. This result is consistent with the findings of Staples and Seddon (2004).

Staples and Seddon tested the technology-to-performance chain model (TPC), where research on task-technology fit and user attitudes were combined to predict performance in two settings: mandatory use and voluntary use. Results of the study showed that social norms had

significant impact on utilization in the mandatory use setting. In contrast, beliefs about use only had a significant impact on utilization in the voluntary use setting. McGill and Klobas (2009, p. 499) described that "[s]ocial norms refer to users' beliefs as to whether most other people who are important to them want them to perform a behaviour. In the case of student use of LMSs, the other people might include academics, other students, family and friends. However, in the study of van Raaij and Schepers (2008) where the use of LMS was mandatory, they found that social norms had no effect on use of a LMS. Participants in this study were MBA students who had been using the LMS extensively for three months.

Studies on system implementation described how an LMS can be improved as a tool to create online courses (on constructivism), such as an interpretive research which was part of the doctoral study of Doguiamas (Doguiamas & Taylor, 2002). The study, which was conducted at Curtin University, was done to analyze an internet-based course using Moodle. The researchers designed the course, which their students could use, featuring a weekly structure, online activities, final essays, forums, and online surveys. Eight students participated in this study using the features of the system that was implemented were used. As teacher-researchers, Doguiamas and Taylor (2002) contended that their findings had achieved three research goals: (1) to learn about constructivism, (2) to reflect critically on their own learning, and (3) to learn collaboratively by engaging others thoughtfully and empathically.

Another study reported on the use of LMS of 100 universities that were sampled from 2,000 higher education institutions in the United States (Falvo & Johnson, 2007). The researchers explored each of the school's website to determine if and how the schools were implementing their online web-based courses. Results of the study indicated that the top LMS used at colleges and universities in the United States was Blackboard, followed by WebCT. Other LMSs used in lesser numbers are eCollege and Angel. There was no indication in this literature that Moodle was used by any institution (Falvo & Johnson, 2007).

Comparing features and capabilities between proprietary and open-source LMS are the common themes associated to decision to use or adopt the system in two studies exampled below (Bremer & Bryant, 2005; Machado & Tao, 2007. In the study of Bremer and Bryant (2005) which compared two LMSs (Moodle vs Blackboard), a trial was undertaken to consider whether Moodle warranted a more formal consideration as an alternative to the institution's current LMS. Reflections from three cohorts of users were gathered from: the instructor using Moodle to teach, the system administrator supporting the system, and 14 students involved in a trial use of Moodle. The system administrator gave his views that

Moodle seemed to be stable and relatively quick on the hardware used for the trial. He commented that few administration issues occurred during the trial. The instructor found that the interface to Moodle seemed reasonably straightforward. The features they used for the course were the functionality that can supply the resources, discussion forums and gradebook. The student participants indicated more preference to use Moodle because of some interesting features compared to Blackboard. The authors concluded that they "are recommending to their e-learning team that Moodle shows significant potential and should be seriously considered for further investigation" Bremer and Bryant (2005, p. 139).

In Machado and Tao (2007), user experiences between Blackboard and Moodle were compared. Two types of groups were formed. First is control group that only used the proprietary solution (Blackboard) second, two study groups: (1) a faculty group, and (2) a student group that used the open-source solution (Moodle), but had previous experience with the proprietary solution established in the pilot project. Online surveys were used to compare the user experience of the basic functionality of each system, such as communication tools, student-student interaction tools, student-instructor interaction tools. Results indicated that there were mixed results on functionality.

Findings showed that participants in the pilot project rated Moodle's course material organization and communication functionality higher, but in other functional areas the data was not definitive enough to reach a solid conclusion. Machado and Tao (2007) opined that there was no clear winner when the systems were compared on functionality. Results from the students in the pilot project preferred the Moodle learning management system over the Blackboard learning management system. Also, results showed that students rated Moodle higher than Blackboard in terms of its ease of use. Conversley, 75% of the students indicated that they would prefer to use it over Blackboard in the future courses that they would enroll in at the university. The results of the research illustrated that, overall, when the systems were compared in their entireties, the Moodle learning management system was the preferred choice of the users. The study concluded that the Moodle learning management system is more efficacious and effective learning management system than the Blackboard learning management system.

The various studies on LMS use discussed in this section are glimpses of the four IS research domains that have definitely different themes being investigated: adoption (Doguiamas & Taylor, 2002; Lee, 2006; McGill & Klobas 2009; Raaij & Schepers, 2008; Staples & Seddon, 2004), implementation (Doguiamas & Taylor, 2002; Falvo & Johnson, 2007), decision to use

(Bremer & Bryant, 2005; Machado & Tao, 2007), and success (Doguiamas & Taylor. 2002; Machado & Tao, 2007; McGill & Klobas, 2009). More focused themes that present academics' use such as actual, perceived, or reported use are reviewed in the next section.

2.4 Academics' use of the learning management system

Academics play a crucial role in determining the success or failure of the systems even though both academics and students are the primary users of web-based learning systems (Selim, 2007). Condie and Livingston (2007) asserted that the successful implementation of web-based learning systems is related to academics' readiness to use the systems. Also, there are motivational factors that drive academics to use these systems. Three contexts of academic use of LMSs are discussed in this section: extrinsic and intrinsic factors (section 2.4.1), personal motivation (section 2.4.2), and perceived, self-reported, and actual use (2.4.3).

2.4.1 Extrinsic and intrinsic factors

On a general perspective of IS use, using an information system is driven by extrinsic and intrinsic motivation factors (Davis, Bagozzi & Warshaw, 1992). Extrinsic motivation refers to "the performance of an activity because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions" (Davis et al., 1992, p. 1112). In contrast, intrinsic motivation pertains to "the performance of an activity for no apparent reinforcement other than the process of performing the activity per se" (Davis et al., 1992, p. 1112). Perceived usefulness is an example of extrinsic motivation, while enjoyment is an example of intrinsic motivation. Perceived usefulness is defined as a person's expectation that using the computer will result in an improved job performance (Davis et al., 1992).

In the context of learning environments, Lee, Cheung and Chen (2005) researched about extrinsic and intrinsic motivation that involved 544 students. Although this study pertains to students, the context of intrinsic and extrinsic motivators is exemplified here. Lee et al. (2005) developed a model by integrating a motivational perspective into the technology acceptance model, which captured both extrinsic (perceived usefulness and ease of use) and intrinsic (perceived enjoyment) motivators for explaining students' intention to use the new learning medium. Results showed that both perceived usefulness and perceived enjoyment significantly and directly impacted the students' intention to use the system. However, based

on the results, perceive ease of use did not manifest a significant impact on student attitude or intention towards system usage (Lee et al., 2005).

Dias and Diniz (2012) conducted a study involving 32 teachers and 36 students. The study investigated the different profiles and needs of teachers in blended learning in higher education. Teachers and students were interviewed to gather their ideas and point of view about the CMS use. Results indicate that there are four dimensions of teachers: activities, interaction, assessment, and collaboration. The first dimension is Activities which explains the types of activities valued by teachers when using the LMS. Results show that there is a strong relationship between the use of different asynchronous tools (e.g.resources, link, glossary) the information content repository, and the teacher-student-content interaction. The second dimension is interaction which refers to the understanding that teachers have about the usage of several interactive tools in LMS. Results suggest that there is a strong correlation with both the use of distinct communication tools (e.g., blog, wiki, chat) and education level (i.e., LMS use has more advantages in Masters or PhD programs compared to undergraduate courses). The third dimension is Assessment described as how to assess students using a LMS. Results suggest that there is a positive association with both the use of work assignments and learning activities (e.g., inquiry, referendum, and quiz). The possibility of monitoring the students' progress within a LMS was also looked upon as a key element in the process of co-construction of knowledge. Collaboration is the fourth dimension, which refers to the way teachers understand the creation of a collaborative community in a LMS. The study indicates that a positive relationship was also observed between the sharing information and online tasks. In this dimension, the researchers implied that teachers are more concerned with the creation of social networks, as well as a privileged space to provide research and information sharing, collaborative learning andnetworking (e.g., discussion forums, debates). They confirmed from their findings that the concept of collaboration is based upon a set of interactions with various complexity levels (Dias & Diniz, 2012). These profiles of teachers are relevant in this thesis context to compare the interests of teachers to this thesis' findings.

2.4.2 **Academics' personal motivation to use the LMS**

Academics' personal motivation to use can be manifested on their adoption or use of the system. Some studies have identified this theme. For example, results of the study by Wang and Wang (2009) on instructor adoption of web-based learning systems in Taiwan indicated that *intention to use* had a direct positive effect on system use. System quality, service

quality, and self-efficacy are found to increase perceived ease of use. Service quality is found to contribute more to perceived ease of use compared with the other two variables. Wang and Wang (2009) argued the importance of effective and timely support to assist instructors in using web-based learning systems. They claimed that system quality, which can be measured by factors including the design of user interface and the usefulness of the functions provided, may influence perceived ease of use. System quality and service quality are obviously external factors, while self-efficacy is internal to the academic.

Some studies about adoption have been carried out (e.g. Zhu, Valcke, & Schellens, 2010; Heo, Lim, & Kim, 2010; Jarrahi, 2009; Joeckel Iii, Jeon, & Gardner, 2011; & Keaton & Bodie, 2011). Similarly, there are notions that one should explore first before venturing to adopt such as put forward by Kim, Song, & Nerkar, 2012, or being motivated to continue usage (Larsen, Sørebø, & Sørebø, 2009), or in the contrary, shift to a more convincing system such as the new online paradigm (Linda, 2000). However, there are critical issues thathas to be investigated for e-learning delivery. Apparently, what may seem obvious is not always put into practice as argued by McPherson, & Nunes, (2008).

Among the constructs investigated, system usage is of interest to this research. However, system usage was not defined and the measures on system usage were not factored in to include voluntary usage in Wang and Wang (2000) study.

Gautreau (2011), on the other hand, investigated the motivation factors of faculty use of the LMS in a single college in one of the universities in California. A need assessment methodology was applied in that study to identify specific factors that motivate faculty to adopt an LMS in their teaching strategies. There were 42 full-time tenure and tenure track faculty who participated in the study where they were asked to rank motivating factors to use the LMS. Results pertaining to motivating factors were ranked from first to last, as follows: (1) salary, (2) responsibility, (3) achievement, (4) advancement, (5) company policy/administration, (6) work itself, and (7) recognition.

Harrington, Staffo and Wright (2006) conducted a study on the faculty use and attitudes toward a CMS in improving instruction. Seven tenured and tenure-track professors at a major US Southeastern research university participated in that study. A 45-minute individual interview consisting of 26 questions was conducted. The questions related to faculty use of, and attitudes, toward the course management system. Analysis of the resulting text was conducted using the grounded theory methodology. Results indicated that five overarching

categories emerged from the analyses: motivations; benefits; perspectives; differences in course formats; and issues and needs. Although results were surprisingly based on differing levels of experience related to age and overall familiarity with technology, there were some interesting similarities across the experience spectrum. Harrington et al. (2006) suggested that researchers need to look into further research areas and consider some questions, e.g.: (1) Do faculty in different disciplines use CMS differently, and is attitude toward CMS different among varying disciplines? (2) Do women use CMS differently more than men in improving content or instruction? (3) Are there significant attitude differences between the genders concerning CMS? (4) How is the language barrier an issue for international faculty in the use of a CMS? (5) How do various types and levels of training and support influence CMS use? (6) Additional investigation is needed regarding how course management systems influence faculty reflection on teaching. More studies about the use of LMS of academics in different themes are discussed in the next section.

Samarawickrema and Stacey (2007) found the importance of training and professional development on using a course management system. Their study demonstrated that timely training in different areas and readiness of staff to be trained is necessary. Appropriateness, applicability, timeliness, and relevance of professional development are indicators of worthiness for the staff (Samarawickrema & Stacey, 2007). Also, their study signified that participants require different levels of training because they were at different levels of adoption. The findings in their study with regard to the needs and design are relevant issues that this thesis explored.

2.4.3 **Academics' perceived, self-reported and actual use of LMS**

Measuring actual usage can be justified by investigating computer logs while self-reports about usage – whether voluntary or mandated can be gathered from surveys or interviews. Data from logs are more reaistic accounts of system usage. Most studies, however, did not indicate that the system was used voluntarily. For example, Clark, Beer and Jones (2010) conducted an exploratory case study using a data mining technique. The aim of their study was to analyze academics' and students' involvement with the LMS, and the links between the LMS, the academic, and the students. Using log data, the researchers examined the LMS features within the University and how academics and students use those features. Results showed that academics were focussed more on content than in creating opportunities for discussion and community. The researchers also examined the data to see what was occurring

in a single academic's course site in terms of content, forums, hit counts, and grade. Overall, the study posited the view that an academic's approach to their understanding of teaching is aligned with feature adoption within the LMS. Their study has shown that using the data logs from the LMS server can verify the involvement of both the academic and the students.

Furthermore, it has verified that there is a correlation between academic participation, discussion forums, and grade. The data that were mined from the LMS in Clark, Beer and Jones' (2010) study demonstrates that the academic has a high hit count, between 2,300 and 10,000 for all courses, indicating that there is involvement in the courses offered. Student activity has clearly demonstrated that they were interacting with the LMS and the academic. However, the researchers acknolwledged that there were some discrepancies that needs to be further researched such as establishing a statistical relationship significance between academic's user behaviour and student's engagement.

The study conducted by Lonn and Teasley (2009) explored the uses and perceived benefits of using the LMS to support the traditional classroom as reported by students and academics at a large American Midwestern university. Two years of survey data were examined focusing on specific uses of the LMS that emphasized either efficient communication or interactive teaching and learning practices. Aggregate user log data were matched with corresponding survey item data to see if system use was consistent with patterns seen in the survey results. Findings from that study suggested that instructors and students value tools and activities from efficient communication more than interactive tools for innovating existing practices. Results also showed that survey item analysis revealed that instructors and students also highly value teaching and learning tools within the LMS.

Posea, Mihaila, Trausan-Matu, Cristea and Gartner (2006) conducted a study to develop an evaluation method for e-learning platforms. Their study was based on different types of measurements collected in logs of interactions during learning sessions and on the analysis of collaborative learning activities. The activities were performed using social network visualizations of the relations established among users during the experiments. Two platforms: Moodle and Sintec (a knowledge-based collaborative learning system developed at the National Center for Information Technology (in the University "Politehnica" of Bucharest) were used for the case study to evaluate the system's actual usage. Actual usage was based on the analysis of time and frequency aspects and logs, and on visualizations of social networks. The study indicated that in the experiment with Sintec, no logs of the collaborative tools were recorded and, therefore, no such indicators were computed. The

study showed that in the case of Moodle, the forum collaborative tools were available to students but their use was not mandatory or even rewarded.

Based on the log data, the small number of posts per user and especially the number of replies showed that the students preferred alternative communication channels. Results further demonstrated that the average length of the posts signified that the replies given were rich in content. For evaluating collaborations using visualization techniques, the researchers contended that network interaction signified that the teachers communicated well with the students. But it also showed that there were no strong teams in the group of students because the network is centralized around the teacher. Posea et al. (2006) concluded that social networks can provide a large numbers of indicators that offer information about the way students and teachers collaborate in the learning process. The researchers believed that the indicators found in their study can and might be correlated with indicators obtained from questionnaires and logs.

Perceived and self-reported uses are also useful, but this does not measure actual usage. A study of Garrote and Pettersson (2007) examined lecturers' attitudes towards LMS, with particular reference to identifying obstacles to increased use. Twenty-two lecturers who had used WebCT during the previous nine months were interviewed. Results showed that most of the lecturers, including those who only used minor parts of the LMS, believed that they could benefit from using an LMS in the future. Also, the study did not support the hypothesis that fear of the complexity of the system or unwanted effects on education are important reasons for lecturers not to use the LMS. It was found that when lecturers decide individually to use tools in the LMS, the major concern is the initial amount of work compared with the expected benefits.

The studies of Clark et al. (2010), Lonn and Teasley (2009), and Posea et al (2006) suggested the usefulness of data logs as a means to verify and justify the actual use of the system among academics. Data abstraction is a credible source of information on how participants in the teaching and learning environment use the information system. On a different set of cohorts, Sheard (2007) investigated the patterns of interaction among students to model the student learning behaviour that were collected on log files. Sheard (2007) developed a data abstraction framework that defined six different abstractions, which is a useful representation of the learning activities during the interaction process. Thus, it is presumed that with computer log data, the actual usage of academics and students in online learning environments is a realistic account of how interactions happen in the virtual space.

2.5 Issues and challenges that impact LMS use

Teaching in a blended learning environment needs specific skills that are aligned with technological, sociological, and pedagogical contexts. Researchers have developed models that are relevant to online learning environments. One of the models, as suggested by Anderson (2008), was developed by Garrison, Anderson, and Archer (2000). The model, which is called 'community of inquiry' (COI), involves three critical components: cognitive presence, social presence, and teaching presence. *Cognitive presence* is the extent in which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication. *Social presence* is defined as the ability of the participants in the COI to project their personal characteristics into the community, thereby presenting themselves to the other participants as real people". *Teaching presence* is the primary responsibility of the teacher in the teaching and learning environment.

To be noted are the two functions of teaching presence in the COI model: the design of educational experience, and the facilitation function. The design function includes the selection, organiztion, and primary presentation of course content. It also includes the design and development of learning activities and assessment. On the other hand, the facilitation function, which can be a shared responsibility of the teacher and other participants, or students, is appropriate in higher education and common in computer conferencing. The facilitation function is the act of making tasks easy for others. In both functions of teaching presence, the main purpose is to realize educational outcomes by supporting and enhancing social and cognitive presence (Garrison et al. 2000).

Many studies have attested to the importance of teaching presence for a successful online learning (e.g., Garrison & Cleveland-Innes, 2005; Shea, Pickett & Pelz 2004; Swan 2004). In a different study, Shea et al. (2006) conducted an extensive investigation of teaching presence and online learning wherein 1,067 online students across 32 institutions were involved. The Shea et al. study developed a survey instrument to measure students' perception of teaching presence. Using factor and regression analysis, it was found that students' recognition of effective "directed facilitation" (p. 182) and effective instructional design and organization on the part of their teacher contributes to their sense of shared purpose, trust, connectedness, and learning. Although the biggest challenge among students' adjustment relates to issues of interaction – both socially and cognitively (Angeli, Valanides & Bonk, 2003), the consensus from these studies is that teaching presence is an important factor for student satisfaction, perceived learning, and sense of community (Garrison, 2007). While social presence among

students were developed through interaction, teacher presence – through its facilitation function, is vital to the success of higher-order learning in an online learning environment (Garrison, 2007).

But why are some teachers challenged or have issues when using the LMS for their classes? Two constraining issues, personal and environmental, are discussed below.

2.5.1 **Personal**

As discussed earlier, there are intrinsic motivators that inspire or encourage some academics to use systems. Conversely, there are also constraints that impede or hold back academics to use a system. Intrinsic constraints are issues and challenges within the control of the user, such as his/her attitude towards the system, or the effect on him/her when using the system. Acceptance of the system, motivation, skill level, and time management, among others pertain to intrinsic constraints (Giardina, 2010; Lameras et al., 2012)

However, intention to use can only be justified if the user has actually used the system, not only intending to use it. A major barrier to academics' adoption of information technologies is the academics' lack of knowledge and ability to integrate the technologies into their teaching practices (Cuban, 2003; Thomas & Stratton, 2006). Both studies have found that a major barrier to academics' adoption of information technologies is academics' lack of knowledge and ability to integrate the technologies into their teaching practices. These had a strong impact on academics' non-confidence on the usefulness of the technologies/IS and their reluctance to use the technologies/IS (Anderson, 2008).

Online interaction, communication, and facilitation are three of the major hurdles that academics experience. The study of Pauleen and Yoong (2004) has attested these hurdles. They used a grounded action learning approach whereby two research methods were combined (grounded theory and action learning) to investigate the nature of e-facilitation for face-to-face and for distributed electronic meetings. Results in that study indicated that learning to facilitate electronic meetings is a complex and difficult experience. The research process that Pauleen and Yoong (2004) had applied enabled them to ascertain the importance of training to enhance the skills for interaction and communication online.

2.5.2 **Environmental**

There are environmental issues that impact the use of LMS. Such issues are related to constraints. Constraint is defined as "anything that limits a system from achieving higher performance versus its goal" (Goldratt, 1988, p. 453). In contrast to intrinsic constraints, extrinsic constraints are outside the personal or behavioural level of an individual. Extrinsic constraints cannot be controlled by a user. However, measures can be recommended or suggested by the user or other stakeholders to improve or increase the usage of an IS. Examples of these are institutional policies, network infrastructure and computer problems, training policies, support services, students' access, etc. This research personally uses environmental constraints as a collective term for common issues and challenges such as the ones in this example. Collectively, these extrinsic constraints are called environmental constraints in this thesis.

Some studies have justified the relationship between system usages of academics to environmental issues (e.g. Lin, Singer, and Ha 2010; Macharia & Nyakwende, 2010; Nanayakkara, 2007; Ocak, 2011; Wang, Doll, Deng, Park and Yang, 2013, and Suwannakoot, Sarkar, & Dick, 2011). For example, Lin et al. (2010) investigated university members' use of and resistance to a communication information technology system (Blackboard) in a higher education organization. Lin et al. (2010) employed the technology enactment framework in their case study to examine structure enactment in university members' technology use and resistance. The researchers explained that the view of emergent structure and enactment suggests that individuals constitute structures and highlights their roles in their repeated interactions with technology. Furthermore, the case study found that the following structures were enacted in organizational members' interactions with the system: maximum use, enhancing teaching, augmenting service, limited use, and resistance. The researchers emphasized that besides providing empirical evidence to the enactments of inertia, application, and change, their case study added a new enactment type, i.e., resistance, to the existing enactment typology.

On the other hand, Macharia and Nyakwende (2010) investigated the factors that inhibit or accelerate the adoption and diffusion of LMSs by academic staff for teaching and learning activities. Their study used a paper-based questionnaire survey completed by 82 lecturers from a selected sample of public and private universities in Kenya. The results of analysis from that study indicated that the characteristics of the Vice Chancellors/Chief Executive

Officer (CEO) are important determinants of LMS adoption and diffusion by instructors in higher education. These characteristics include: keenness on modern information and communication technologies (ICTs), influence on ICTs development, and, visionary ICT leadership. Results also showed that organizational variables of subjective norm, availability of ICTs, organizational support, organizational readiness, and top management support were related to behavioural intentions to use LMS by academic staff for teaching and learning. Furthermore, results suggested that top management support was found as the dominant factor in predicting the acceptance of LMS.A study by Peszynski (2005) about power and politics in a system implementation was carried out putting executive administrators in a similar context as having a crucial role in adoption and diffusion of systems.

Nanayakkara (2007) investigated the factors that influence or inhibit the adoption of e-learning systems in universities, institutes of technology and polytechnics in New Zealand. Participants in that study were teaching academics from different tertiary institutions whose answers to a questionnaire helped determine their views on adopting LMS in their teaching process. A theoretical framework for user acceptance of e-learning systems was developed and analyzed with the following factors related to: (a) individual characteristics, (b) individual perceptions, (c) LMS system characteristics, (d) external system characteristics (e) organizational support, and (f) organizational characteristics. Results of the study revealed that there are three key groups of factors that affect the adoption of e-learning systems in tertiary institutions: individual, system, and organizational. In addition, results illustrated that while individual factors have significant contribution to the LMS adoption, the system and organizational factors are the most crucial factors for user acceptance in e-learning systems. In particular, the participants ranked release time for staff, ease of use of LMS, perceived usefulness of LMS, training and support to develop online content, and reliability of information and communication technology infrastructure as the five most essential factors for staff uptake of e-learning systems.

Ocak (2011) conducted an exploratory, qualitative case study that examined the problems and impediments that faculty members encountered in blended learning environments in a Turkish Higher Education system. Seventeen faculty members from four universities responded to eight interview questions. Findings of that study were based on content analysis of interview transcripts. The results showed that faculty members' problems with blended teaching resulted in the identification of three inductive categories: instructional processes, community concerns and technical issues. There were eight themes that emerged from these

three categories. The themes include the following: (1) complexity of the instruction, (2) lack of planning and organization, (3) lack of effective communication, (4) need for more time, (5) lack of institutional support, (6) changing roles, (7) difficulty of adoption to new technologies, and (8) lack of electronic means. The Ocak (2011) study indicated that teaching blended courses can be highly complex and have different teaching patterns. Notably, the complexity of the teaching patterns impacts the successful implementation of the blended college courses.

In the study of Wang et al. (2013), they developed a model that was tested by 379 faculty respondents. In their study, Wang et al. explored the effects on the faculty course developers, who used the reconfigurable characteristics of the software based on the seven principles of effective teaching framework of Chickering and Gamson (1987). The model was presented based on two notions. The first notion corresponds to the faculty course developers' perceptions of interface reconfigurability. Interaction reconfigurability and content reconfigurability of the software can facilitate LMS use for effective teaching practices. The researchers defined the reconfigurable components as follows: (1) interface configurability is the capability by which software enables faculty changes in the look and feel of the course website; (2) interaction configurability is the capability of the software which enables the instructor to establish communicative mechanisms among students or between students and the faculty member; and (3) content configurability is the capability of the software that provides a lot of options for faculty to upload or modify course material. The second notion pertains to the perception that the use of the LMS to implement these effective teaching practices enhances faculty perceived benefits.The researchers believed that if LMSs are to be considered pedagogically effective, these systems must help engage faculty in effective teaching practices. The results of that study suggested that all three systems' reconfigurability dimensions have significant impacts on helping faculty use of the LMS to implement effective teaching practices. Of these findings, interaction reconfigurability has the strongest relationship with the seven principles.

Suwannakoot et al. (2011) conducted a case study that explored the usage of Student and Administrative Management Systems (SAMS) in an Australian university. The objective of their study was to explore the use of SAMS as perceived by users - academics, administrative staffs, system administrators, and students. Results of the investigation uncovered the difficulties associated with SAMS usage and resultant actions undertaken by users. These users were facing more difficulty to use the systems because of the misfits from the

implementation and organization settings. Workarounds were suggested for systems that can not be delivered or which cannot support the usage.

Relating environmental constraints to the theory of constraints (TOC); TOC was summarized in Rahman (1998) as: (1) *Every system must have at least one constraint*; and (2) *The existence of constraints represents opportunities for improvement*. Rahman explained that [c]ontrary to conventional thinking, TOC "views constraints as positive, not negative. Because constraints determine the performance of a system, a gradual elevation of the system's constraints will improve its performance (Rahman 1998, p. 337).

The above studies have identified various external and environmental problems on system usage that impede or enhance the usage of IS and LMSs by academics. In the context of this thesis, the insights of TOC are relevant when investigating about the effects of environmental constraints with academics.

2.6 Chapter summary

The studies presented in this chapter wherein the internal and external factors are presented, has given this research better perspectives about the dynamics of system usage. More importantly, the contention of usage measures remains a challenge for a voluntary system use situation. This was discussed in section 2.2. DeLone and McLean (2003) advocated the inclusion of systems use – suggesting that voluntary systems use of management support systems is a relevant research agenda.

Systems use in teaching and learning was discussed in section 2.3. While several studies were conducted, themes of such studies focused on one of the four Information Systems research domains which are: adoption, implementation, decision to use, and success.

The various literature reviewed in this chapter form part of the comparison in chapter six, wherein the findings of this research are compared. Thus, some details of the studies discussed in this chapter are taken up in chapter six. As will be briefly described in the next chapter, comparing the findings to extant literature is the process of enfolding the literature (Eisenhardt, 1989), which is a major step in the Grounded Theory approach. Moreover, this literature review will be used in chapter six, where findings in this thesis will be compared to the literature. Comparison will be focused on what are similar, or what are not similar.

CHAPTER 3

3 RESEARCH METHODOLOGY

This chapter discusses the design and methodology used in this research in addresing the research questions of this study. It provides detailed discussions of the activities carried out and the steps in which they were done, in order to emphasize the rigour and validity of this research. More importantly, this chapter illustrates the phases that this research has taken and justifies the path taken to generate theory. The two major sections of this chapter cover the discussions about the research design and the methods of data collection and analysis in sections 3.1 and 3.2 respectively.

This Case Study research uses a mixed method approach and employs Grounded Theory as extended by Eisenhardt (1989). Primarily, this research is inclined to being more of a qualitative research, supplemented with quantitative data. Nevertheless, Grounded Theory applies, as the method is viable in either strands of the research. Strauss and Corbin (1998) emphasized that useful research can be accomplished with the 'interplay between qualitative and quantitative' (p. 34) procedures. There needs to be a procedure that can corroborate the findings from what participants have said about their experiences. It is necessary to validate these findings by other means. Thus, the nature of this investigation reflects the interplay as this study considers the best means to achieve the answer is to verify, compare, and supplement results. This research, which investigates voluntary usage of the LMS among academics, argues that combining qualitative and quantitative procedures does strengthen the theory that emerged in the study. Log data of academics' usage of the LMS were analyzed to supplement the coded references from qualitative (interview) data. This procedure is a useful application of the interplay of data.

Further, this chapter presents the justification for using a mixed method for the given research context and research questions being answered. It examines the processes by which the data was elicited, analyzed and then formulated to arrive at the findings. The reasons for using or not using the information system in a blended learning environment cannot be merely referenced or uttered; rather it is more valid to say, that what was said was verifiable. The corroborated outcomes from both the qualitative and quantitative strands (Creswell & Plano Clark, 2011) are helpful means to assess divergent and convergent themes in research.

There are seven major components of this research:

- Data collected from interviewing academics (either having administrative or non-administrative responsibilities; and who belonged to various academic disciplines)
- Data collected fromparticipants' computer log data
- Analysis of qualitative / interview data
- Analysis of quantitative / computer log data
- Comparison of data sources and analysis of mixed data
- Enfolding of the findings with related literature
- Written reports on all findings to eventually disseminate at conferences, journals, and presentations

3.1 Research Design

Research designs are guides or procedures that researchers follow when collecting, analyzing, interpreting, and reporting data in research studies (Creswell & Plano Clark 2011). Philosophical views are offered by experts in the field to deepen the understanding of research designs. Research design as suggested by Creswell (2003) has to adhere to three essential elements: knowledge claims of the researcher including theoretical perspective, strategies of inquiry that will inform the procedures; and the methods of data collection and analysis to be used.

3.1.1 **Knowledge claims**

Creswell (2003, p.6) explained that "knowledge claim means that researchers start a project with certain assumptions about how they will learn and what they will learn during their inquiry". Four alternative knowledge claim positions can be considered when designing research: postpositivism, advocacy/participatory, constructivism, and pragmatism (Creswell 2003). Postpositivism is characterized as having a deterministic philosophy on which outcomes are based from a scientific method. Advocacy/participatory is described as having inquiries that are interwoven with socio-political issues being examined and which are affecting the people being studied, and the changes that are needed. Constructivism is described as a socially constructed knowledge claim that is often combined with interpretivism. Knowledge about the problem is generated from the data, which a researcher

gathers and interprets to formulate / draw a theory. Pragmatic knowledge claim is characterized as having a stance to the centrality of the problem, and uses pluralistic approaches to derive knowledge about the problem.

Another angle to describe the philosophical view of research design, particular to information systems research, is from the works of Orlikowski and Baroudi (1991). Positivist, interpretive, and critical philosophical views, which they differentiated, dominate information systems research (Orlikowski and Baroudi (1991). Positivist studies are describes as based on existing and fixed relationships within phenomena using a structured instrumentation in its investigation. To increase predictive understanding of the phenomena, positivist studies primarily test theories. Hypothesis testing and drawing inferences about a phenomenon from the sample to a stated population characterizes positivist studies (Orlikowski and Baroudi 1991). Interpretive studies are characterized with the assumption that people create and associate their own subjective interpretation as they interact with the environment. Interpretive researchers seek to understand the relationship of their research participants' references and the meaning of these references. The aim of interpretive studies is not to generalize the context, rather, its intention is to "understand the deeper structure of a phenomenon, which it is believed can then be used to inform other settings" (Orlikowski & Baroudi 1991, p. 5). Distinctive to critical studies is its evaluative dimension. In critical studies, the researcher attempts to critically evaluate and transform the social reality under investigation. Critical studies are concerned with critiquing existing social systems and revealing any contradictions and conflicting practices (Orlikowski & Baroudi 1991). An example of a critical study is that of Peszynski and Corbitt (2006) which illustrated a case study about the selection and implementation of an LMS. The issues that were uncovered in this critical study helped expose the politics, complexities, and social drama during systems implementation.

This study considers the combined perspectives of constructivism and interpretivism; and the pragmatic stance (Orlikowski & Baroudi 1991, Creswell 2003). The research aligns with the constructivist/interpretivist stance, as gathered data were analyzed to increase understanding of academics' experiences on their usage of the system. The various patterns of usage that were attributed to academics' practices were interpreted and constructed in this research based on the historical and social perspectives of qualitative interview. These interviews comprise the major component in building the theory. A similar outlook was explained by Schwandt, stating that an interpretive perspective provides a deeper understanding of "the

complex world of lived experience from the point of view of those who live it" (Schwandt, 1994, p. 118). As this study will show, the actual experiences of the academics who participated in this study provide a realistic component to the theory generated which substantiates the idea put forward by Scwandt (1994). The pragmatic stance supplements the interpreted perspective by looking at the actual problems on usage from computer log data. Log data were analyzed and interpreted from the use of interactive and non-interactive features of the system. These log data were interpreted in this research based on two strength levels: (a) high and low usage and (b) two types of usage: interactive and non-interactive.

3.1.2 **Strategies of inquiry**

Strategies of inquiry, as the second element (Creswell 2003), are best described on the operation or applied level procedures that are associated with different research approaches. Quantitative approach is exemplified with research procedures, such as experiments and surveys. In contrast, examples of qualitative approach employ ethnographies, grounded theory, case studies, phenomenology research, and narrative research.

Strategies associated with mixed methods approach have been classified and can use one of the six typologies (Creswell &Plano Clark 2011), namely: convergent parallel, explanatory sequential, exploratory, embedded, tansformative, and multiphase design. From Creswell and Plano (2011), these are briefly described:

- In convergent parallel design, qualitative and quantitative data are collected and analyses of data are done separately. Afterwards, both data sets are merged. Methods are implemented sequentially in explanatory design which starts with quantitative data collection and analysis in Phase 1, followed by qualitative data collection and analysis in Phase 2, which builds on Phase 1.
- In explanatory sequential design, methods are implemented sequentially starting with quantitative data collection and analysis in Phase 1. Collection and analysis of qualitative data follows in Phase 2, which builds on Phase 1.
- In embedded design, data are concurrently or sequentially collected and analyzed and the use of supporting data before, during, or after the major data collection procedures are supplemented (for example, the major procedure is qualitative data collection and analysis, supplemented by quantitative data collection and analysis).

- In transformative design, quantitative and qualitative data sets are framed concurrently or sequentialy within a transformative theoretical framework that guides the methods decision.
- In multiphase design, the quantitative and qualitative data sets are collected and analyzed concurrently and/or sequentially over multiple phases of a program of study.

This research used the embedded design to collect and analyze quantitative and qualitative data. Specifically, the analysis employed grounded theory approach. The guiding principle for grounded theory states that "concepts and design must be allowed to emerge from the data" (Strauss & Corbin 1998, p. 34). By emergence, Strauss and Corbin (1998) stressed that concepts and relationships that have developed from data through qualitative analysis can interplay with quantitative measures to enhance the research process. This had been applied in this research to build and enhance the emergent theory through the processes of identifying, developing, comparing, and relating the concepts.

3.1.3 **Research question**

This research study has answered the following research question:

> ***How do academics use Learning Management System in a voluntary usage context?***

The choice of methodology for this research was driven by the research question.

The answer to the open-ended broad question could not be achieved with a single ethnographic study or with a broad survey tool. To obtain a rich-in-depth source of data, interviews were made. Also, in support to the interviews, computer log data of each academic were collected from the LMS database server.

Three subsidiary questions are linked to the main question:

> ***What enhances academics' usage of a Learning Management System?***
>
> ***What inhibits academics' usage of a Learning Management System?***
>
> ***What measures would be necessary to increase and/or improve the usage of a Learning Management System?***

To answer the main question raised, interview and computer log data from academics of different stature in the university (from the ranks of Instructor to Professor; and from

different academic disciplines) were analyzed. The rich composition of participants in this research enables a highly realistic sense of adherence to the research goals. The emergent theory from this study was used to answer the research questions from the institutional level perspective – that is, from academics with or without administrative responsibilities, and to the executive management level of the university.

3.1.4 **Case study approach**

Case study is the research approach that was used for this study to investigate the voluntary use of the learning management system at MSU-IIT. This section provides an overview of this approach.

Case studies can either be single or multicases, and are usually studies of particularization, more than generalization. (Stake, 2010) argues that a case or cases are being studied by researchers, not because of the methods, stating that: "by whatever methods, the choice is to study *the case"* (p. 119). Cases can be studied analytically or holistically, entirely by repeated measures or hermeneutically, organically or culturally, and by mixed methods (Stake, 1995; 2008). This case study research briefly presents two perspectives – the single case perspective described next, and the mixed method perspective described in a separate section.

3.1.4.1 The single case perspective

Case study research is commonly used in psychology, sociology, political science, anthropology, social work, business, education, nursing, and community planning (Yin, 2014). But this does not mean that case study is limited to these fields. Whatever the field of interest, the distinctive need for case study research arises out of the desire to understand complex social phenomena (Yin, 2014). Yin stated that a case study "allows investigators to focus on a 'case' and retain a holistic and real-world perspective – such as in studying individual life cycles, small group behavior, organizational and managerial processes, neighborhood change, school performance, international relations, and the maturation of industries" Yin (2014, p. 4).

This study adheres to the case characterized by Yin. This researcher believes that the perspective of Yin conforms to the field of human-computer interaction (HCI). HCI study is viewed as the "intersection between psychology and the social sciences, on the one hand, and computer science and technology, on the other (Carroll, 1997, p.16). Such is the applicability

of the HCI field to this case study. HCI is a science of design that seeks to understand and support human beings interacting with and through technology (Carroll, 1997). Although this research is not geared towards design issues, the notion that this study has put through is that of 'interacting with technology' issue that includes the LMS and web technologies. Web technologies are used in several instances to accomplish things including teaching and learning. Web technologies have opened massive opportunities for people to interact not only with information systems, but also with other people in the network realm, just like what takes place when they use social media. Similarly, with the LMS, the human to computer interaction dimension is present. Thus, it is this researcher's belief that the principality of interaction occurring in learning environments and/or social media brings the notion of human-computer interaction (HCI) study in the research field.

For research purposes, there are three types of case studies that can be used: explanatory, descriptive, and exploratory or causal (Benbasat, Goldstein & Mead, 1987; Yin 2014). In the same manner, different approaches (for example, experiment and survey) could be applied for exploring, explaining, or describing the phenomenon. Yin (2014) suggested that it is not hierarchy that distinguishes the different methods but the three important conditions consisting of:

- the type of research question posed,
- the extent of control a researcher has over actual behavioral events, and
- the degree of focus on contemporary as opposed to entirely historical events

Yin (2014) differentiated five major research methods: experiments, surveys, archival analyses, histories, and case studies. He explained how the research methods can be distinguished from each other. For example, in experiments, answers to the research questions are answerable from 'how' or 'why' questions. Experiments require control of behavioral events (e.g. differentiating performance scenarios or conditions for groups or individuals). Focusing on contemporary events is explained as situating an experiment in the current or updated state. On the other hand, answers for survey research questions are from questions like who, what, where, how many, and how much. It does not require control of behavioral events, and focuses on contemporary events.

Although the case study research method conforms to experiments when posing the type of research question - 'how' or 'why', the case study does not conform to experiments in terms of the control of behavioral events. However, the case study method conforms to the survey

approach in its focus on contemporary events (Yin, 2014). Notably, case study, experiment, and survey have similarities in the focus context, that is, all three approaches deal with contemporary events or the current/most recent occurrence of its investigation.

By all indications from Yin (2014), the three conditions were adhered to in this investigation suggesting that doing a single case study is appropriate. Investigating what enhances and inhibits LMS usage as a complement to traditional face-to-face classroom provides a tangible viewpoint in this research of how academics utilize current technological innovations to their advantage in a blended learning environment. While Garrison and Kanuka (2004) argue that blended learning has a 'transformative potential', this research argues that there are also practical reasons why academics have taken a 'back-seat' in terms of usage of the system. This research question was answered in this investigation.

3.1.4.2 The mixed method perspective

A case study can be studied using a mixed method (Stake, 1995). This description by Stake (1995) was echoed in Creswell & Plano Clark (2007, p.5) which states:

> Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis and the mixture of qualitative and quantitative approaches in many phases of the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems that either approach alone.

A mixed method perspective was earlier emphasized on the premise about the interplay of data (Strauss & Corbin, 1998). Describing the mixed method analysis in this study is expounded in section 3.2.

The analysis that formed the theory, which answered the questions, is discussed in the analysis and theory development in Chapter 5, and the enfolding literature in Chapter 6. The final theory that answers the research questions is presented in the conclusion chapter 7.

3.1.5 **Why Grounded Theory**

Grounded theory, as a methodology, originated from the early works of Glaser and Strauss (1967). They defined grounded theory as "the discovery of theory from data – systematically obtained and analyzed in social research" (Glaser & Strauss 1967, p.1). This methodology

has evolved into different threads (Urquhart, 2007), but there are essential components that were maintained (Strauss & Corbin 1998).

Strauss and Corbin (1998) described grounded theory as a research methodology where theory is derived from data that are systematically gathered and analysed. Strauss and Corbin emphasized (with bold texts) that "the importance of this methodology is that, it provides a sense of **vision, where it is that the analyst wants to go with the research**. The techniques and procedures (method), on the other hand, furnish the **means** for bringing that vision into reality" (1998, p. 8). In the context of this study, the 'vision' of this research, as stated in Chapter 1 (section 1.3) builds the theory of voluntary system usage and relate this phenomenon to how academics in MSU-IIT used the LMS. The vision was achieved by investigating the realistic views from academics, their experiences, attitudes, and feelings when they used the system. Their computer logs were also collected to supplement what they said.

Strauss and Corbin (1998) contended that data collection, analysis, and eventual theory have close relationship with one another; and that the theory derived from the data is more likely to resemble the reality. Grounding concepts in data is the main feature of a grounded theory method, suggesting that the analytical process is both a science and an art.

> It is science in the sense of maintaining a certain degree of rigor and by grounding analysis in data. Creativity manifests itself in the ability of researchers to aptly name categories, ask stimulating questions, make comparisons, and extract an innovative, integrated, realistic scheme from masses of unorganized raw data (Strauss & Corbin, p.13).

Adhering to this characteristic of grounded theory as presented by Strauss and Corbin (1998), this research followed the methodology by exercising rigor and creativity in building the theory. The processes (methods) used in data gathering and analysis (which are detailed in section 3.2) are characteristic of a rigorous undertaking while at the same time maintaining creativity.

Grounded theory method (GTM) has been increasingly used in the information systems (IS) discipline using qualitative methods (Urquhart 2007). Yet, being a new research field, one issue with IS research is "our willingness to fully engage with theories outside our own area" (Urquhart 2007, p 350). The prevalence in the use of information technology in every aspect of the modern world (Urquhart, 2007) raises important issues about interaction. Urquhart

advised that it is important for IS researchers to theorize because "theorizing helps us deal with the modern world" (Urquhart 2007, p. 350). She elaborated:

> The unique juxtaposition of technological artifacts and people in information systems research means that there are all sorts of theoretical possibilities around that interaction and… there is a very real need for theory of all kinds to be generated in this area, not only for the discipline, but for the wider world whose everyday life is infused with technology (Urquhart 2007, p. 350).

Notably, the aim of this present research has matched the proposition brought forward by grounded theory for information systems research. Notwithstanding the differences in the two strands (Glaserian and Straussian) of grounded theory, their works plus that of Charmaz (2006) and Urquhart (2013), provided a better idea why grounded theory best fits this study. Consequently, guidelines were produced (Urquhart, Lehmann, & Myers 2010 in Urquhart 2013, p. 182) along the process of building the theories. The components of the guidelines suggested by Urquhart et al. (2010, p. 185-186) are:

1. **Constant comparison** is the process of constantly comparing instances of data labeled as a particular category with other instances of data in the same category
2. **Iterative conceptualisation** is the process of increasing the level of abstraction and relating categories to each other
3. **Theoretical sampling** stresses the importance of deciding on analytic grounds where to sample from next in the study
4. **Scaling up** is the process of grouping higher-level categories into broader themes contributing to the generalizability of the theory
5. **Theoretical integration** which means relating the theory to other theories in the same or similar fields - is the process of comparing the substantive theory generated with other, previously developed, theories.

The following sub-sections detail the processes as suggested in the guidelines that were implemented in this research.

3.1.6 Building theory from Case Studies

This section describes the essential components of the research processes for this study. The analytical process of theory building from a case study is succinctly described in eight steps by Eisenhardt (1989), which was used as a guide in this study. Following Yin (1984),

Eisenhardt (1989) described case study as a research strategy which focuses on understanding the dynamics present within single settings; and can involve single or multiple cases and several levels of analysis. Building theory from case study provides information how the research plan can be carried out (Eisenhardt, 1989).

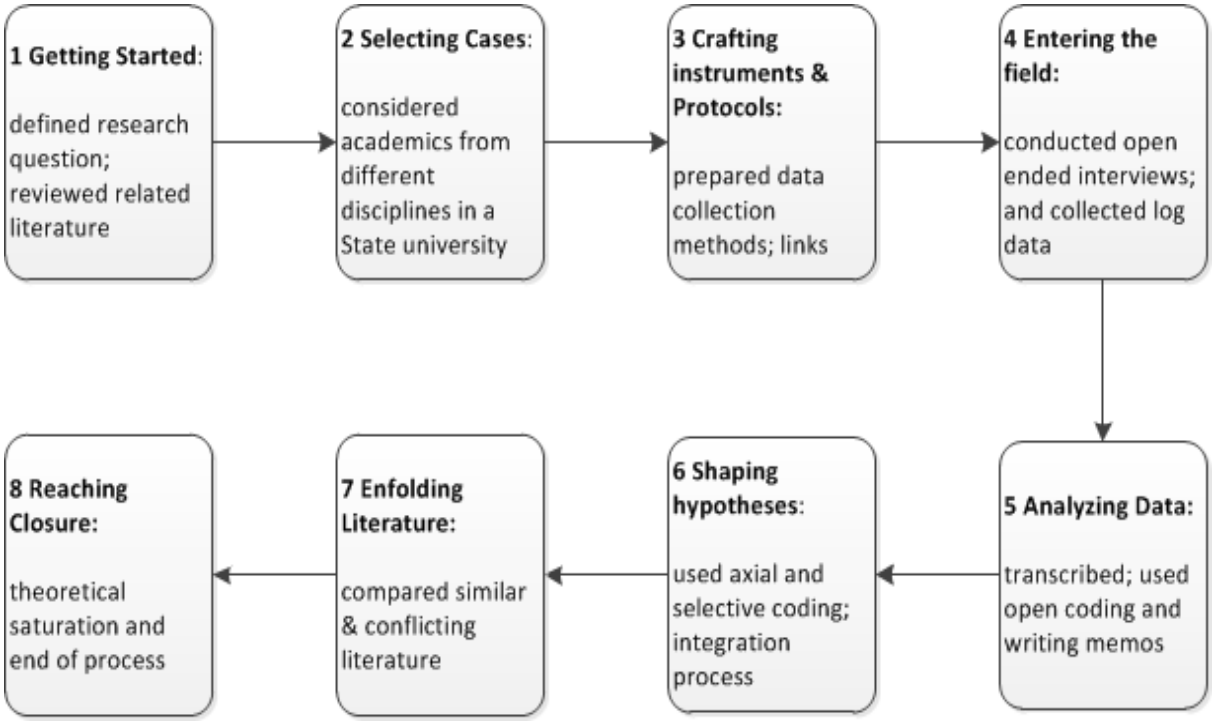


Figure 3-1: The eight-step process of building theory from case studies (adapted from Eisenhardt 1989)

Figure 3.1 illustrates the overview of the process used in this case study based on the grounded theory approach. The numbered bold texts in Figure 3-1 are the literal headings from Eisenhardt (1989).

Getting started was the first step done which dealt with reviewing related literature and defining the research questions. The review of related literature was concentrated on blended learning environments and system usage. Theoretical assumption was not necessary because this research built the theory from this investigation. The main research question and the subsidiary ones were framed from the experiences of this researcher with the LMS at MSU-IIT, as user, and as trainer. This is explained in the next step.

The second step done is ***selecting cases***. This study is a single case. Two major criteria became the bases of the case selection: per researcher's usage and training experience; and by browsing Philippine university websites. MSU-IIT has similar courses that most private and public universities offer. The Mindanao State University (MSU) system which has eight

campuses was also considered in the selection of the case. However, from among these eight campuses, only MSU-IIT has implemented the use of a learning management system.

The third step called ***crafting instruments and protocols*** involved outlining the interview questions and getting consent from participants. Protocols necessary for the conduct of this research was accomplished by requesting permission from the executive management presented during Ethics application, which included the participants' invitation and consent to participate (see Appendix A and B). The research aimed to understand why usage of the LMS was minimal despite the support provided by the university administration. To address this objective, open-ended questions were used (highlighted in Appendix B). The outlined interview questions served as the guide for the interview process.

The next steps are illustrated in more detail in Figure 3-2.

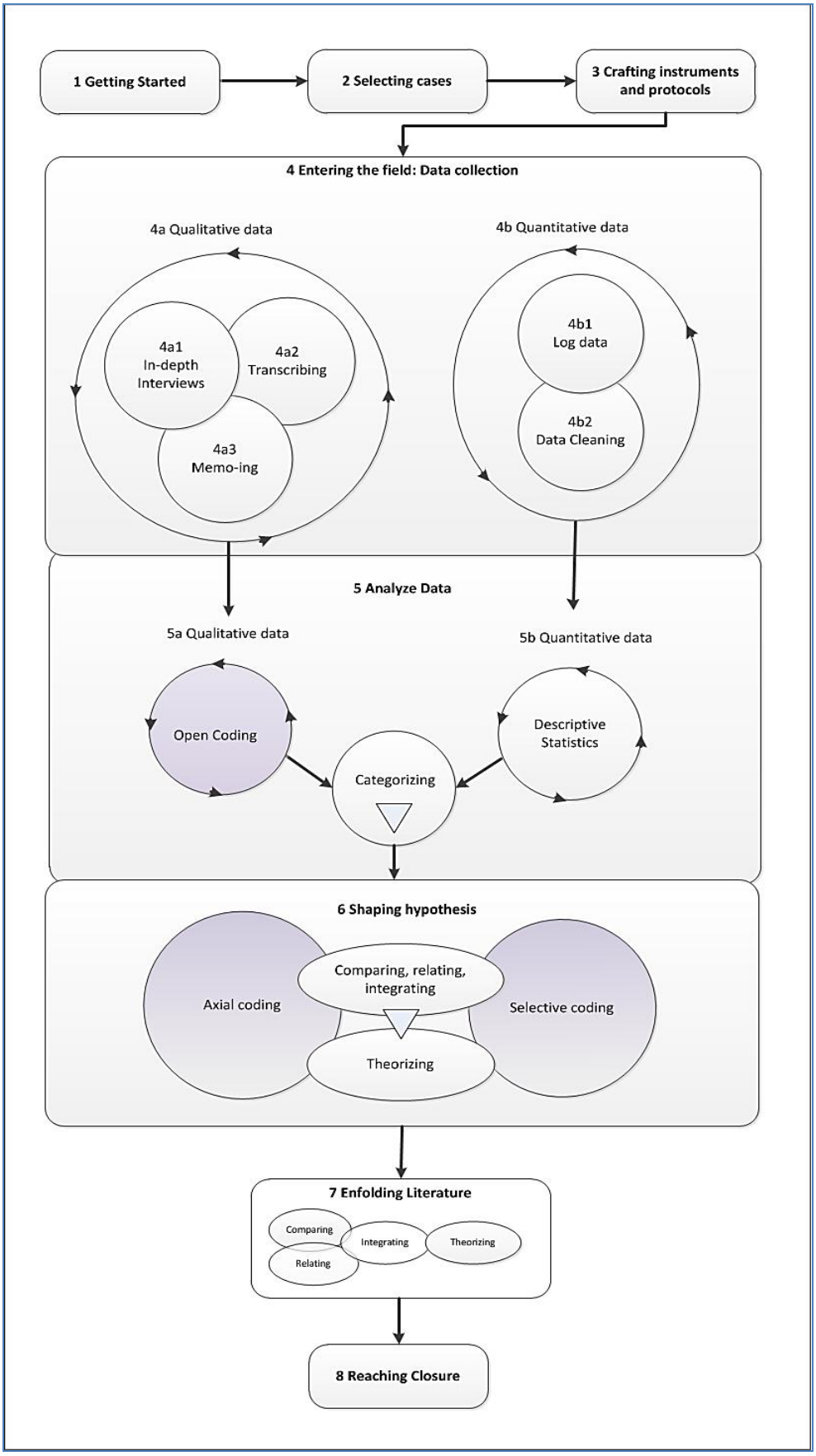


Figure 3-2: Building theory in a case study using Eisenhardt's (1989) eight-step process and Grounded Theory approach introduced by Strauss & Corbin (1989)

The fourth, fifth, and sixth steps are interlinking steps that have similar cyclical process. This means, for every single step, the processes within each step (and for each participant's data) are iterative (or repetitive). The iterative loops are key elements to the research process (Bruno 2011). In Bruno's work (2011), iteration was presented for the qualitative data collection and analysis, and shaping hypothesis. The iterative steps in Bruno (2011) was utilized in this research. However, it has extended the use of the iterative processes for quantitative data, because this study is designed to build theory utilizing mixed sources.

The fourth step which is **entering the field** is the data collection stage from two data types. Qualitative data were gathered from the open-ended interviews with 33 academics. Computer log data of the participating academics were also gathered. These processes are detailed in section 3.2 (methods of data collection and analysis).

Analysis of data is done in the fifth step. The crucial step of analyzing the data involved open coding of qualitative data, and computing for averages and median values of quantitative data using descriptive statistics. These processes are further explained in section 3.2.4.

Shaping of hypothesis occurs in step six where the themes that emerged are further analyzed by comparing data from different categories. This step involves selective and axial coding. Also, relationships of each of the concepts and their dimensions were analyzed. Shaping hypothesis is a major step on theorizing. Strauss and Corbin (1998, p. 25) emphasized theorizing as an "act of constructing from data an explanatory scheme that systematically integrates various concepts through statements of relationship". Urquhart et al. 2010 (in Urquhart, 2013) called this process as 'scaling up' which helps to generalize the theory.

Enfolding the literature is the seventh step where findings are being contrasted and compared to strengthen the theory and proposed framework in this research. Urquhart et al. 2010 (in Urquhart, 2013) called this process as 'theoretical integration', which 'is an obligation of grounded theorists' (p 186).

Reaching closure is the eighth and last step where the decision is made when to stop adding data (or cases, if it is a multiple case study). Normally, theoretical saturation is reached at this stage. Reflecting on the iterative process of the grounded theory approach, a'two-step closure' was ensured in this research: in the data gathering stage; and in the presentation of results stage.

Firstly, theoretical saturation was reached when there was no more new or unique information that were gathered from the participants. In particular, after the 24th interviewee, some additional details were included, thus a few questions were asked from more participants. Hence, paticipants to this study numbered to 33 academics when theoretical saturation was reached. This process is detailed in section 3.2.1

Secondly, reaching closure was also considered as the time when findings from this study are shared to audiences in conferences, and written in journals. This researcher has committed to present the findings and recommendations to the administration of MSU-IIT. Thus, this notion was already pre-arranged with regard to the schedule – practically, after findings and analysis stages are written. Eventually, workshops were conducted at MSU-IIT for two sub-groups: a group comprising most of the participants who did not have administrative functions, and another group composed of administrators (at the executive and dean's level, as well as graduate coordinators).

Finally, the outcomes of this study are considered for upcoming presentations at national and international conferences, and submission to journals.

The process of building theory from case study research requires constant backward and forward iteration which can possibly alter the research question (Eisenhardt 1989). The possibility that research question could be altered occurred in this study.

3.1.7 **Participant Recruitment and Sample Size**

The study was conducted in Mindanao State University-Iligan Institute of Technology (MSU-IIT) one of the eight campuses of a state (public) university system in Southern Philippines (Mindanao). This university offers undergraduate and graduate degree programs (Arts & Social Sciences; Business & Accountancy; Education; Engineering & Engineering Technology; Science & Mathematics; Nursing; Computer Science & Information Technology). During the period of this study, the total number of full-time academics was 491, while there are 11,159 students. In this university, the LMS used is called MOLÉ – an acronym for MSU-IIT Online Learning Environment.

As a preliminary step to data collection, the assistance of the system administrator was sought to know about the number of academics who used MOLÉ. This was ascertained through computer logs, which is only under the jurisdiction of the system administrator. The system administrator then provided a list of active users from the different colleges and schools. The

list was the basis for recruiting participants to this case study. Among those invited, 33 academics agreed and participated in the open-ended interviews. Of these participants, twelve held an administrative position, while 21 are academics without administrative responsibilities. Their age ranged from 25 to 65 years old, in which 17 were females, and 16 were males. Colleges/schools were grouped in three clusters, namely group A – Engineering, Technology, and Science & Mathematics; group B – Education, and Arts & Social Sciences; group C – Business, Nursing, and Computer Studies. The 33 academics were grouped according to their cluster. Details of the attributes of participants are discussed in section 4.1 of Chapter 4.

One of the requirements to get approval from the Ethics Committee of RMIT University (2012) was to ensure that the anonymity and the rights of the participants are respected. Also, an approval has to be sought to use audio recording devices, and the collection of computer logs of the participants. Adherence to these policies was done and was expressed in the Plain Language Statement (see Appendices A) when invitation to participate was handed to prospective participants. Through a personal invitation (face-to-face), the researcher was able to maximize participation. Furthermore, face-to-face invitation allowed more time for the procedure and the collection of their computer logs to be explained and clarified. Collecting their computer logs can be daunting for prospective respondents if procedures are not properly explained. Thus this step of assuring them about confidentiality, and their rights was extremely necessary for this case study. Particulars of data collection and analyses are detailed in the subsequent sections.

3.1.8 **Identifying limitations – Researcher Subjectivity**

This research was conducted in a single university: MSU-IIT. While it may limit the breadth of this investigation, the processes that this research has undertaken allowed for more depth than multiple case studies. Participants who were recruited to join this research came from different disciplines and colleges in the university, and each participant either holds an administrative or non-administrative position. In keeping with the research objectives and research methodology, this research aligns itself to a single case study, naming the university as the main entity.

This researcher has been previously involved on training academics of MSU-IIT in the early stages of the university's LMS implementation. Involvement in training had stopped in 2007. Distancing herself from training academics gave this researcher a better perspective to

investigate how academics have been using MOLE since its implementation ten years ago. Preliminary observations showed that despite a decade of implementation, the utilization of MOLÉ was minimal, with only 20% of academics using the system voluntarily. It is this phenomenon that is being investigated in this study

Following Glaser and Strauss (1967), the following features are kept in mind with regard to a researcher's responsibilities to avoid research bias during the analysis of mixed data:

- the ability to step back and critically analyse situations
- the ability to recognize any tendency toward a bias (as discussed previously)
- conceptualize or generalize (understanding that each concept can have multiple meanings)
- a sensitivity to words and phrases discussed by interviewees
- a sense of absorption and adherence to the research plan

The processes of analyzing data are presented in the subsequent sections.

3.2 Methods of data collection and analysis

This section presents the methods of data collection and analysis. A mixed method was applied in this research because the investigation requires a deeper analysis of the accounts of the participants' experiences and what they actually do. The analysis examined the interviews first, then, it moved on to scrutinize the computer logs to supplement what the participants said. Interviews were collected and analyzed using the qualitative process (discussed in sub-section 3.2.1), while computer logs were analyzed using descriptive analysis (discussed in sub-section 3.2.3. The triangulation process is discussed in section 3.2.4.

3.2.1 **Qualitatative Interview process**

This section describes the interview process that includes the preliminary step, the main interviews, and the transcription of data. An introduction about the research tool – NVivo, is also presented.

The interviews began in the second week of May, 2012. The participants chose the schedule of the interview, as well as the venue. Almost all of the participants chose to have the interview done in their offices (for academics with administrative position). On the other hand, other participants selected a vacant classroom or space in the campus. Eventually, two

participants per day were scheduled during the span of the interview period (mid of May, to first week of July, 2012).

This researcher had in mind to interview at least 21 to 24 academics at the first instance. It is important not to limit the number of participants because the saturation point has to be attained. Saturation point in this context is the point in time where there are no more different or unique idea coming from the remaining participants. In reference to the list provided by the computer center's system administrator, invitation to participate was handed out to the prospective participants on a day to day basis. The participant was given time to read the invitation. Subsequently, they chose when to collect the consent form and the schedule for the interview. Giving and securing consent form is a necessary step which entails "informing the participants about the overall purpose of the investigation and the main features of the design, as well as of any possible risks and benefits from participation in the research project (Kvale & Brinkman 2009, p. 70).

From among those invited to participate in the study, one declined because of a busy schedule. However, he suggested two academics from his department who accepted the invitation. Overall, two other invitees did not decide to participate because of personal reasons.

Before the interview commenced, each participant was asked if he/she has questions or issues about the interview, or being interviewed. He/she was made to understand, and was reminded, that the proceedings were to be recorded, and field notes will be used. Should they have issues, they were assured that they can ask the researcher to withdraw their participation. Bearing in mind the Rubin and Rubin (2005, p. 79) 'conversational partnership' stating that in a "conversational partnership, the researcher is obligated to behave in a courteous and ethical way".

To arrive at the answers to the main research question for this study, six interview topics that were included during the interview were outlined. Of these six topics, there were some follow-up questions prepared to verify or clarify, when necessary, the topic being addressed.

These are:

- Story about experiences in using Moodle (or MOLÉ)
- Attitude towards using the LMS
    - Why they feel this way

- Frequency of use
    - How often; and why?
- Reasons for using (or not using) the LMS (motivation)
    - Motivated or not motivated to use, why?
- Issues and challenges
    - What are the issues and challenges? Give the three most problematic issues/challenges
    - Name the other issues and challenges
    - What workarounds were initiated to address the issues or challenges?
- Teaching and learning strategies they practiced

Follow-up questions were prepared only for the purpose of clarifying or verifying issues, but they were not strictly followed (literally), since the role of this researcher was to actively listen. "Active listening is the interviewer's ability to listen actively to what the interviewee says" (Kvale & Brinkman, 2009, p. 138). Kvale and Brinkman (2009) described that active listening is an art of fielding follow-up or second questions. Becoming an expert interviewer is learnt. They advised researchers of becoming an expert interviewer:

> immersed in the concrete situation and is sensitive and attentive to the situational cues that will allow him or her to go on with the interview in a fruitful way that will help answer the research question, instead of focusing all attention on the interview quide, on methodological rules of interviewing, or on what question to pose next (Kvale & Brinkman, 2009, p.139).

Responses from the interviews were categorized to answer the question why some academics decided to use MOLÉ or why others did not. For the last part of the interview, the participants were asked to make some suggestions and recommendations that may help bring the issues and challenges to the university's management, and to other academics.

This researcher is conversant in two languages which are predominantly used in the region. One of the languages is Tagalog, which is the basis of the national language. It is largely used in the Northern part of the Philippines. The other one is Visayan for people coming from Visayas and Mindanao – the Central and Southern Philippine islands. Thus, even though the questions were asked in English, the interviewees can choose what dialect to use. More often, interviewees would choose what language to use. Interviewees chose to speak in English.

While conducting the interview, note taking was also done paying more attention to 'striking' terms. Field notes were as important as using audio recorders (this interviewer used two digital recorders simultaneously; one being a back-up unit).

Field notes were read to the participant when reviewing the conversation to validate their answers and insights. The participants were thanked before the interview ended. In addition, their email addresses were noted so that further communication could be done when clarification was needed.

Another valuable use of field notes during the interviews allowed the researcher to review about what transpired during the conversation, and to refer to the notes with regard to what and how the participants shared their experiences, or answered the topics. This was an opportunity to compare at the earliest time, and looked at what other questions may be needed or could have been missed. Hence, during the data gathering period, this researcher was already writing memos to identify some themes. This activity did conform to writing theoretical memos which Glaser (1978) suggested as a key tool to use when in the field. From these notes, further guidance on who to invite or interview next was established. For example, by the time the 24th interview was accomplished, referring to the field notes brought forward some additional questions pertaining to age group and number of teaching years, as well as minimal period of usage of MOLÉ. Thus, additional participants were invited, making it to 33 academics being interviewed. This process conformed to theoretical sampling, which Urquhart (2013) describes as a key strategy for building a grounded theory. Consequently, two major questions emerged out of the process of theoretical sampling (Glaser and Strauss, 1967, Urquhart 2013): what groups or subgroups do one turn to next in data collection; and for what theoretical purpose.

Strauss and Corbin (1998) emphasized that "the aim of theoretical sampling is to maximize opportunities to compare events, incidents, or happenings to determine how a category varies in terms of its properties and dimensions" (p. 202). This study did the necessary steps to achieve the aim of theoretical sampling with the addition of another feature, more interviewees. The number of interviews performed in this grounded theory methodology was dictated by the theoretical sampling having reached theoretical saturation. The theoretical sampling was done based on the emerging concepts where the number of final interviewees was not yet known, and even the type of interviewees was not yet fixed. Hence, the objective of theoretical saturation was only fulfilled with acquiring 33 academics who have different attributes. Attributes are considered the properties of the categories in this research.

3.2.1.1 Transcribing interviews

A software transcribing tool (Express Scribe Transcription Software) was used for the purpose of controlling the start and stop points of the conversation.Some of the terms and sentences that were said by the participants were in the local dialect, which were accordingly translated while being transcribed. It took almost three months to transcribe the 33 interviews, which was solely done by this researcher. Transcribing alone was a choice, and engagement with the data helped to write memos, and to develop the themes at an early stage. The transcribed intereview texts were then loaded to NVivo – a software tool used, which is described in the next section. Once loaded, the interview texts are ready for coding. Coded words, phrases, or sentences are called coded references in this thesis.

3.2.1.2 Using NVivo as a research tool

NVivo version 10 was used in this study as a research tool to help organize and manage qualitative data. NVivo was developed and provided by a software company - QSR International Pty Ltd (QSR, 2013). QSR promotes NVivo as a research software that can be used by anyone who wants to examine, manage, shape, or make sense of unstructured information. QSR designed the software that can be used by researchers, academics, forensic scientists, psychologists, tourism managers, sociologists, consultants and students around the world. It was explicitly stated in their website (http://www.qsrinternational.com) that the qualitatitive software tool does not do the thinking for somebody who uses it. Rather, NVivo provides a workspace and the tools to work through one's information. The tools were built to classify, sort, and arrange information so that researchers can give more time to analyze information/data, identify themes, gather insight and develop meaningful conclusions (QSR, 2013).

Researchers have mixed responses on the usefulness of using NVivo for the analysis of qualitative data. For example, Welsh (2002) compared using NVivo with the manual process, stating that NVivo allows interrogation and analysis of data at a particular level, allowing engagement with the data, and the derivation of impressions and concepts from it. Thompson (2002) shared that, at the early stages of analysis, NVivo can help make sense of the huge amount of data collected and the complexity of analyzing it. Bruno (2011) emphasized that the tool itself does not replace immersion in the data because reflection and analysis are done by the researcher. NVivo simply facilitates organizing and sifting the data to enable the researcher to perform the inductive analysis, using the research interpretation of the data. Despite the helpfulness of using such powerful software, the analysis takes place in

the researcher's mind; and as such, NVivo is no more than a database, although extremely useful in maintaining the chain of evidence for a massive amount of data (Diaz Andrade, 2007).

In addition to what was mentioned above, the software can facilitate in the coding process because of its capacity to sort, match, and link data (Bazeley & Richards, 2002; Bruno, 2011). It can provide invaluable assistance to the researcher in answering the research questions from the data, without losing access to the source data. Subsequently, NVivo supports the analysis of qualitative data by managing data, managing ideas, querying data, graphically modelling, and reporting from the data (Bazeley 2006). As a research tool, NVivo facilitates the "coding" of interesting concepts in each transcript, and enables queries of raw data and coded concepts to facilitate the axial and selective coding, in consonance with the research methodology analysis performed (Bruno, 2011). Adam (2007) stated that the software allowed each slice of data of the transcript to be given a conceptual code (i.e., open code). Once some slices of data were coded, NVivo allowed the remaining slices of the transcript to be examined and compared to already assigned codes (Adam, 2007).

NVivo does not perform the actual analysis for a researcher (Bazeley, 2006). Thus, the use of this tool does not ensure the rigour of data analysis. The grounded analytical process was performed by this researcher in a rigorous manner for valid and substantive theory to be produced. This tool allowed the analysis of the collected data to be done in a more organized and systematic way. It also provided more opportunities for this researcher to engage with the data. NVivo efficiently handles the rudimentary tasks involved in organizing the data, which provided the flexibility when re-coding and re-examining the concepts being developed. Engagement with the data improved this researcher's understanding of the emergent concepts and enabled constant comparison of the coded references.

For coding, NVivo was used in this research. Coding is the core of grounded theory methodology which is an essential component of data analysis. Coding is the analytic process through which data are fractured, conceptualized, and integrated to form theory (Strauss & Corbin 1998). It is the "pivotal link between collecting data and developing an emergent theory to explain these data" (Charmaz, 2006, p 46). Charmaz (2006) further explained that it is through coding where you *define* what is happening in the data and begin to grapple what the data meant.

After coding, coded references were grouped and categorized for further comparison and analysis. The usefulness of NVivo became more apparent as the data can be exported to Excel and Word (Microsoft, 2014) to further compare and analyze them with the tables and summarized reports respectively. Qualitative data analysis is discussed in the next sub-section, highlighting on the following stages: open coding, axial coding, and selective coding.

3.2.2 **Qualitative Data Analysis**

Qualitative data analysis entails three essential steps of coding: open coding, axial coding, and selective coding (Strauss & Corbin, 1998). The coded references were given a name or a label that closely describes the selected codes. Giving a label to the coded references makes it easier to group (categorize/classify) the items that are the same, or similar; and to closely examine the data. The coding process was time-consuming, however, Strauss and Corbin (1998, p. 102) reminded that "closely examining data for both differences and similarities allows for fine discrimination and differentiation among categories"

The coding led to the analysis of the data into three levels of abstraction, as shown in Figure 3-3. Analysis started on the open coding where **themes** are roughly identified. In this research, the themes are representation of "slices of data", which is one of the four key characteristics of grounded theory methodology (Urquhart, 2013, p. 16). The themes were then grouped and classified/categorized and were then moved to the next higher level – called **dimensions.** In further grouping, the highest level called **concepts** were formed. Figure 3-3 illustrates the levels of abstraction process for each of the interview transcripts.

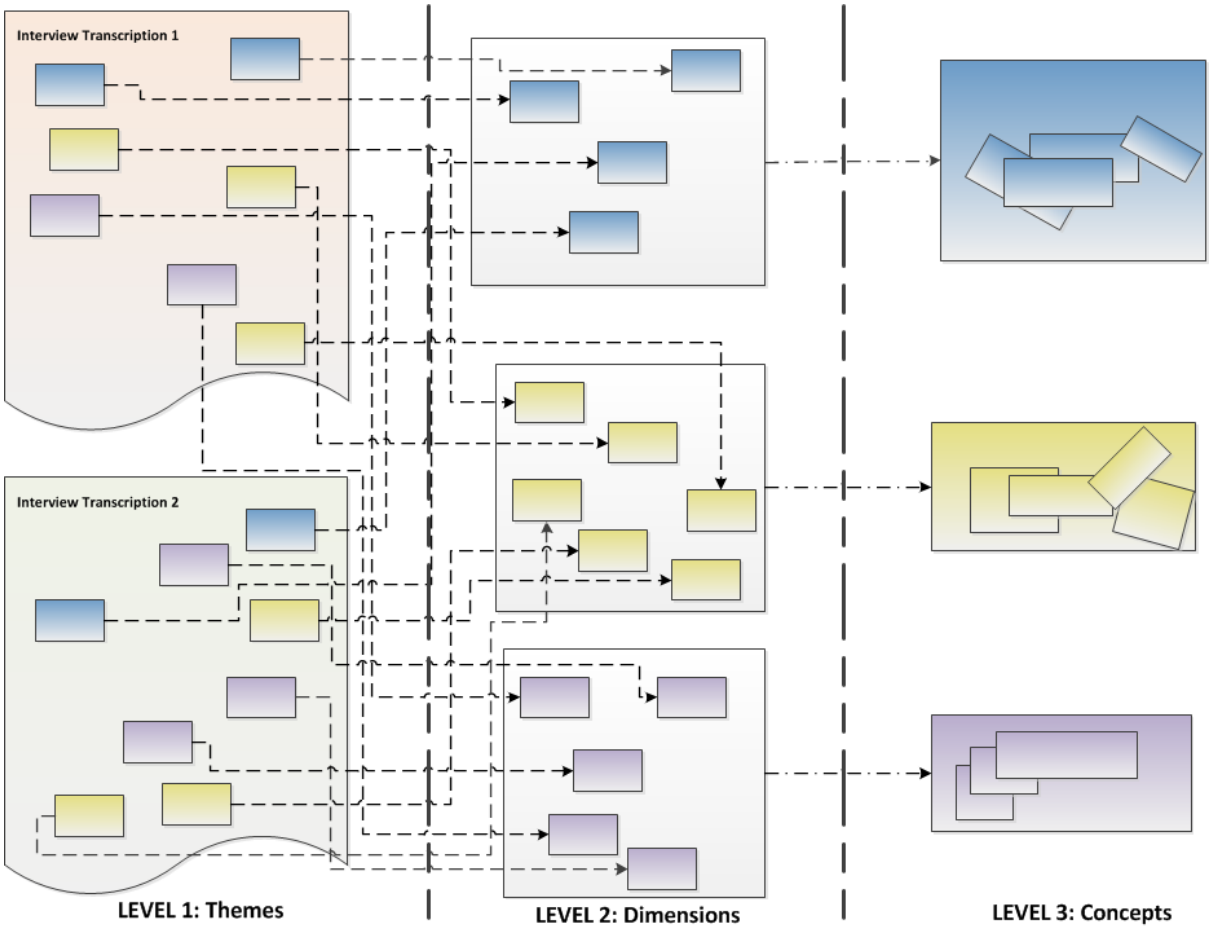


Figure 3-3: Levels of data abstraction

Open coding is the first stage of the analytical process, which begins by closely examining the words or phrases (coded references) in each of the sentences of a paragraph. Below is an illustration of the open coding process of two excerpts from the transcripts of two interviews. The coded references are shaded in the box alongside a number. When coding the references using NVivo, the numbers were not included. The number is for illustration purposes only. In this illustration, the number indicates the label and the grouping of the code. In NVivo, grouping is performed by just dragging the selected code underneath the main node[1].

Excerpts from Interviewee transcripts 1

Researcher: So, can you tell me the reasons for using – or your motivation to use MOLÉ?

I think for one, I have seen the potential – for really improving teaching and learning (1). It's a good complementation (2) – that time – because I realized that it is still difficult to offer a purely online course – it's a good complement to a classroom setting. In fact to a point that I

[1]**Node in Nvivo denotes a theme**

even experimented in a classroom situation (3) – while everybody is there and they are with the computer. I really combined the classroom and online for the meantime (3). It can be done, like instead of typical question, for example, actual classroom, I'll raise a question or an issue. Then everybody will give their responses, (3) typically, but the modification that I used is there's a feature in Moodle – the journal – where one will have to journal – wherein I post a question (4). Since everybody has access to MOLE at that time to that subject, then they can have the response to that question, and only me can see it. (3) So, I decided to use it, so that I can encourage those who are not very participative (2) [not the talkative ones] …

But I think the beauty of doing that, at least with user journals is prior to turning back the results of the answers to a survey – answer to a particular question, I could have a good idea of how many have similar answers, commonality of answers, and differences of answers, and the like. And now, [with that] I can focus on such grouping of people [for answers made on such and such]. Then, I use the actual classroom to validate their responses. So the process is now shorter, because I have already categorised their responses. So, it is very useful in that context.(1)

Excerpts from Interviewee transcripts 2

Researcher: What are your reasons to be motivated in using MOLE?

Probably, because the Internet is there (2) for one, and using it to the optimum, to me, could give more benefits to those who access the net. (2) I thought that being updated with communication technology (2) while I am not an expert in it, being updated is also part of growing, personally. Personally, I would be able to understand what the young are talking about even if I don't fully understand(2) it, for one. …

But it's different when you do practice online teaching because you are able to trace what you have started, what you are doing, and what you wish to do, in terms of feedback from the students. (2)

So, while some of them say: maybe we should have tackled this topic more comprehensively – we were not able to do this. So, this gives me also the chance to ask myself: Is accessing the Internet for instruction really effective for our kind of students, given our set-up? (6)

While there is the philosophical question behind, this motivates me to enter into this endeavour there is also that motivation on the other side which tells me: you have to upgrade your techniques you have to upgrade your methodologies. So it is a philosophical motivation, it is a personal motivation, as well as curiosity as to what is there(5)

In the illustrations shown above, the numbers stand for groups of themes, which are as follows:

(1) Improves teaching and learning process

(2) MOLE usefulness

(3) Teaching strategy

(4) MOLÉ feature / task

(5) Personal impression

(6) Evaluating usefulness

With open coding, 273 themes were initially procduced (see Appendix E- open-coded themes). As illustrated in the examples above, the numbers represented the diverse themes. Along the process, these themes were then grouped and categorized. This process was repetitive, allowing for the codes to be named, renamed, compared, deleted, or merged. In this way, more comprehensive and meaningful classification was achieved. For example, all coded references that are numbered (2) in both excerpts from the two participants were grouped and then classified. The group was then given another name - MOLÉ usefulness.

Axial and selective coding are the second and third coding steps, respectively (Strauss and Corbin (1998). In the eight-step building theory with a case study process (Eisenhardt 1989), coding occurs in the fifth and sixth step. Strauss & Corbin (1998) defined axial coding as the process of relating categories where coding occurs "around the axis of a category, linking categories at the level of properties and dimensions" (p. 123). It is to be further noted that the procedure of axial coding involves laying out the properties of a category and their dimensions – which has to be done in open coding (Strauss & Corbin, 1998). In this research, nine categories were created from the data. These identified categories became relevant when comparing and differentiating views and references of the participants. Selective coding is the process of "integrating and refining the theory" (Strauss & Corbin, 1998, p.143).

Figure 3-4 illustrates an example of axial coding. The category, *academic discipline,* used in this example is from the data in this research. It has three properties or attributes: group A, B, and C. Coded references from these groups were compared first in the category level; and then in the dimension level. The three-way arrow indicates that cross-sectional comparison is done for all of the groups. A similar process was performed for all categories in this study.

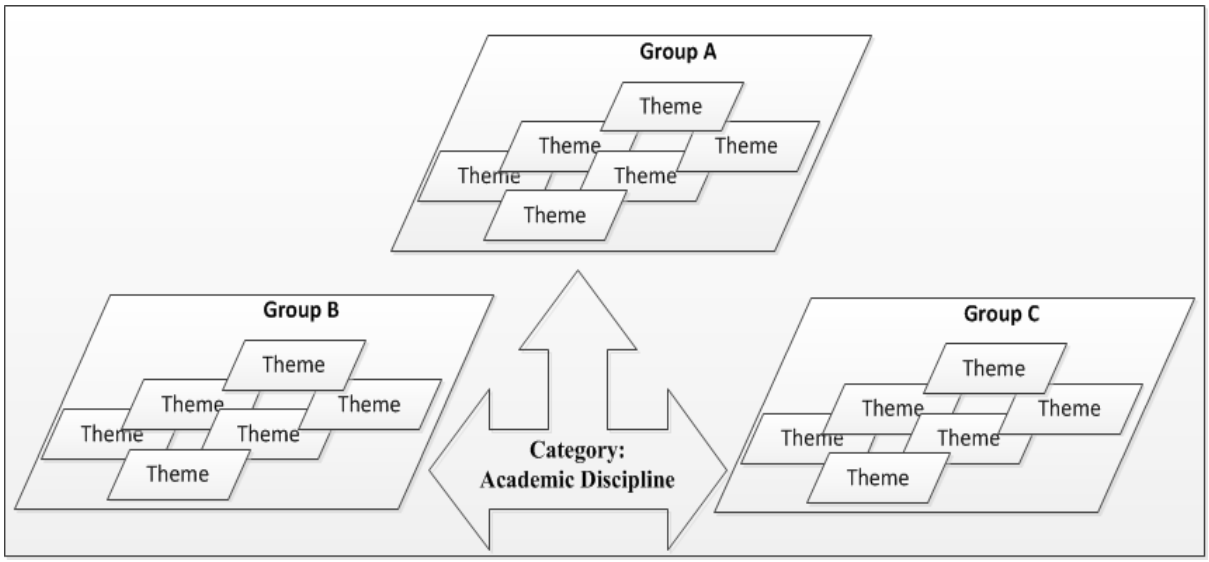


Figure 3-4: Illustrating axial coding process on the category level

To further deepen axial coding analysis, a comparison is made in the concept level. Four dimensions, namely, time management, curriculum level constraints, students' access and economic viability, and students' work and validity of control were abstracted, compared, and related. These four dimensions are the components of the concept named – learning environment constraints. The dimension and concept level axial coding is illustrated in Figure 3-5. The figure shows the 'within and between'comparisons done in this level of analysis which is already a progression to selective coding. The selective coding process is repeatedly performed in all categories, dimensions, and concepts.

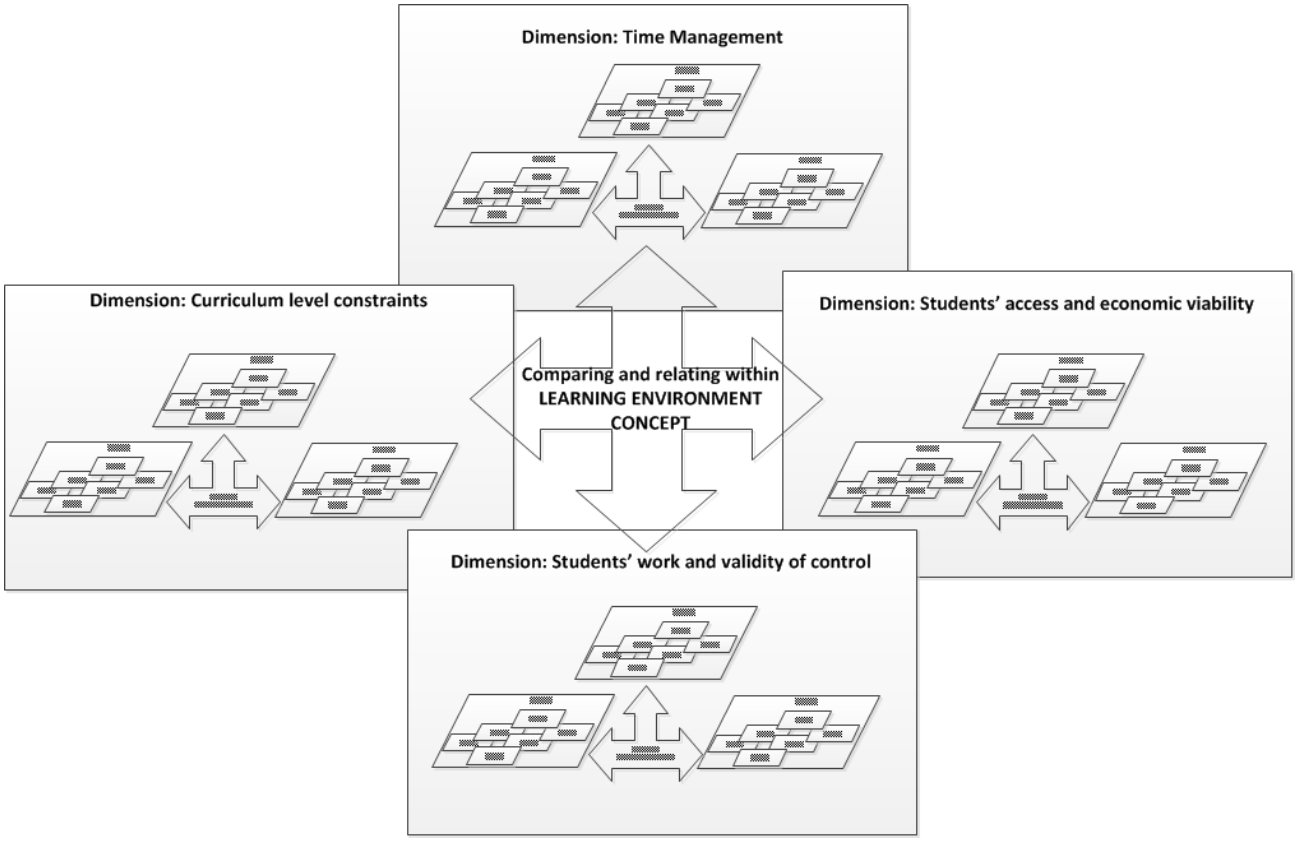


Figure 3-5: Illustrating axial coding on the dimension and concept levels

The procedure from the example is an application described in the coding process which involves two types: initial coding and focused coding (Charmaz, 2006). Initial coding is carried out by naming each word, line, or segment of data followed by a focused selective phase. This phase uses the most significant or frequent initial codes to sort, synthesize, integrate, and organize large amount of data (Charmaz, 2006). In the above example, grouping and categorizing is a focused type of coding and theoretical integration takes place. Charmaz (2006, p. 46) explained that "theoretical integration begins with focused coding and proceeds through all your subsequent analytic steps". Theoretical integration also happens when concepts are developed from the processes done in axial and selective coding as what occurred in this thesis.

A much higher level of theoretical integration is discussed in the supplementing mixed data section (section 3.2.4) after discussing qualitative analysis in section 3.2.2. Quantitative data collection and analysis process are described next.

3.2.3 **Quantitative Data Collection and Analysis**

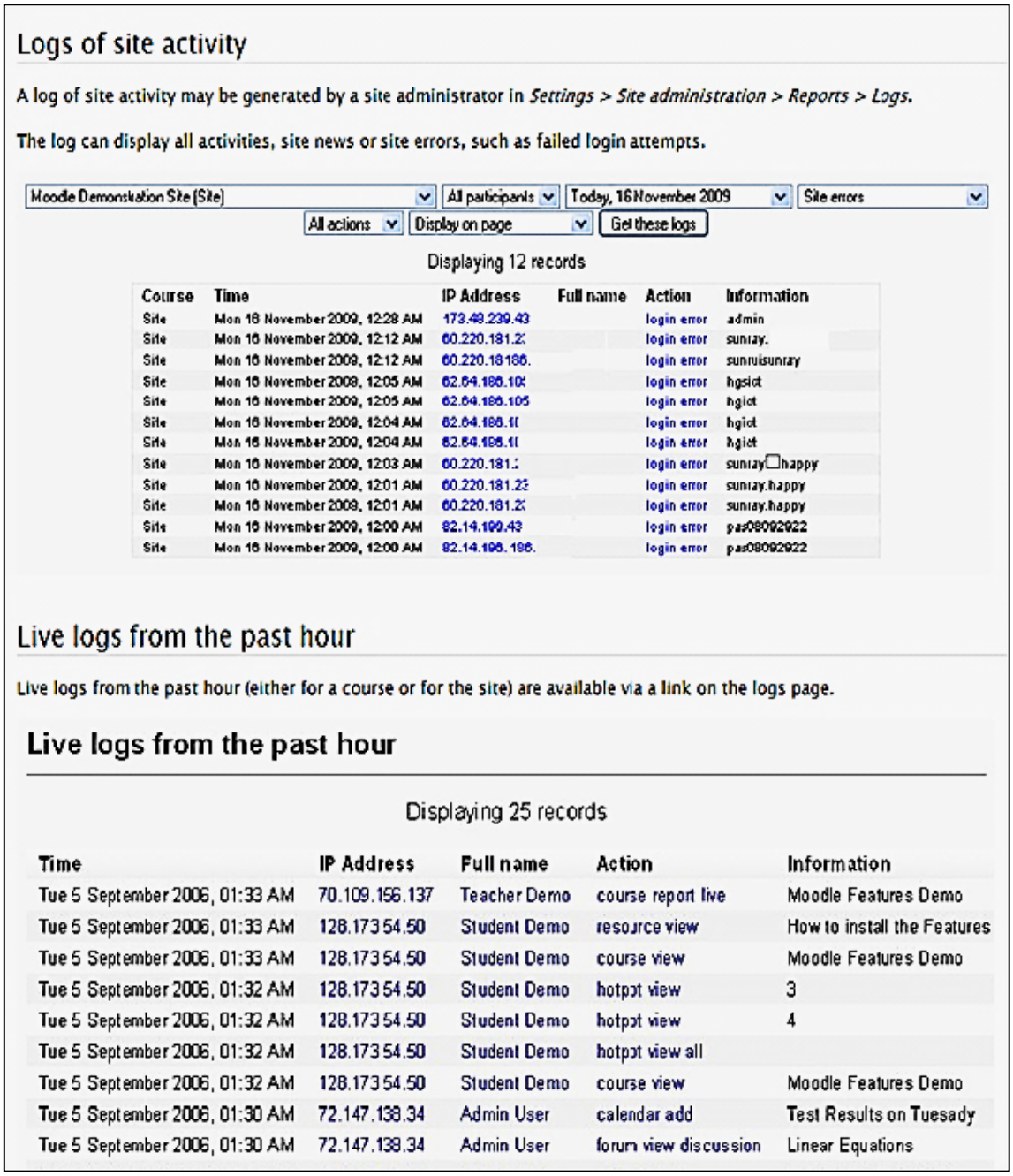
The quantitative data were mainly gathered from the MOLÉ database server. The collection process was through a remote connection with the server from this researcher's workstation from Melbourne. This researcher was given access rights to gather computer log data usage for a specific period from MSU-IIT. The collection of log data was hugely dependent on the internet connection from both RMIT and MSU-IIT. Computer logs were collected between August to November, 2012.

MOLÉ uses Moodle (Moodle, 2012) – a software that can report transactional data within the system in the form of computer logs. Computer log data are represented as either summarised visual graphs, or in database form detailing the records of the activities and the time that user transactions occurred. With computer logs, different stakeholders can be informed of the various aspects of system usage. For example, the database and network system administrators have specific tasks on the management and control of the system, which allows them to refer to computer logs relating to the traffic volume or problems in the network, as well as monitor the usage of each user. For academics, they can look at the computer logs for different purposes such as who logged in and when, and they can also find out what activities their students performed, such as viewing or reading course materials, submitting assignments, participating in forums, or other activities that are possible in the system. Such information about activities and actions can be derived from computer logs and were used in this research to verify the different dimensions of the participants' interaction with the system.

Computer logs have been used in various studies (for example, Sheard, 2007; Romero, Ventura, & García, 2008). Sheard (2007) investigated students' use of a web-based learning environment. She developed a structured methodology to process and analyze unstructured raw Web log file data of students' interactions and relate the information to the learning behavior and learning experiences of students. In Romero et al. (2008) they presented various data mining techniques that have exemplified a Moodle-platform learning environment. Both studies argue for the usefulness of analyzing computer log files to arrive at the relationship of the extracted data from databases to learning outcomes and behaviours of users.

Two examples (log of site activity and live logs from the past hour) from the Moodle website are shown in Figure 3-5 to inform about the raw data structure of computer logs that were

collected during this investigation. For privacy and confidentiality purposes, an extract from the database server of MSU-IIT cannot be shown here as an example.



Logs of site activity

A log of site activity may be generated by a site administrator in *Settings > Site administration > Reports > Logs.*

The log can display all activities, site news or site errors, such as failed login attempts.

Moodle Demonstration Site (Site) | All participants | Today, 16 November 2009 | Site errors | All actions | Display on page | Get these logs

Displaying 12 records

Course	Time	IP Address	Full name	Action	Information
Site	Mon 16 November 2009, 12:28 AM	173.49.239.43		login error	admin
Site	Mon 16 November 2009, 12:12 AM	60.220.181.2[illegible]		login error	sunray.
Site	Mon 16 November 2009, 12:12 AM	60.220.18186.		login error	sunruisunray
Site	Mon 16 November 2009, 12:05 AM	62.64.186.10[illegible]		login error	hgsict
Site	Mon 16 November 2009, 12:05 AM	62.64.186.105		login error	hgict
Site	Mon 16 November 2009, 12:04 AM	62.64.186.1[illegible]		login error	hgict
Site	Mon 16 November 2009, 12:04 AM	62.64.186.1[illegible]		login error	hgict
Site	Mon 16 November 2009, 12:03 AM	60.220.181.[illegible]		login error	sunray□happy
Site	Mon 16 November 2009, 12:01 AM	60.220.181.2[illegible]		login error	sunray.happy
Site	Mon 16 November 2009, 12:01 AM	60.220.181.2[illegible]		login error	sunray.happy
Site	Mon 16 November 2009, 12:00 AM	82.14.199.43		login error	pas08092922
Site	Mon 16 November 2009, 12:00 AM	82.14.196.186.		login error	pas08092922

Live logs from the past hour

Live logs from the past hour (either for a course or for the site) are available via a link on the logs page.

Live logs from the past hour

Displaying 25 records

Time	IP Address	Full name	Action	Information
Tue 5 September 2006, 01:33 AM	70.109.156.137	Teacher Demo	course report live	Moodle Features Demo
Tue 5 September 2006, 01:33 AM	128.173.54.50	Student Demo	resource view	How to install the Features
Tue 5 September 2006, 01:33 AM	128.173.54.50	Student Demo	course view	Moodle Features Demo
Tue 5 September 2006, 01:32 AM	128.173.54.50	Student Demo	hotpot view	3
Tue 5 September 2006, 01:32 AM	128.173.54.50	Student Demo	hotpot view	4
Tue 5 September 2006, 01:32 AM	128.173.54.50	Student Demo	hotpot view all	
Tue 5 September 2006, 01:32 AM	128.173.54.50	Student Demo	course view	Moodle Features Demo
Tue 5 September 2006, 01:30 AM	72.147.138.34	Admin User	calendar add	Test Results on Tuesady
Tue 5 September 2006, 01:30 AM	72.147.138.34	Admin User	forum view discussion	Linear Equations

Figure 3-6: Two examples of log data that can be generated from a database server

Each of the participants' log files was saved in electronic spreadsheets. Most of the logs were exported as *.csv* (comma-separated values) files. Before analyzing the data, preliminary steps were undertaken, like re-configuring the position and order of the data in rows and columns.

These were done using the 'pivot table'. With the pivot table, it is easier to extract the needed information.

3.2.3.1 MOLÉ log terminologies

This section presents the components of MOLÉ and the users' interaction with it. The terminologies used are described to aid in understanding the logs that are shown in each of the tables discussed in chapter four. Users of MOLÉ start their interaction with their course/subject by logging on to its main page. Once logged in, the database server records every instance of the interaction. Records of transactions are made for activities in the online classroom, such as:

- When teachers add the lessons or learning materials to their courses and also when lessons are updated and edited;
- When teachers or students participate in discussions and contribute in the forum in asynchronous mode;
- When teachers or students participate in real-time discussions – which are recorded as chats;
- When teachers require students to upload their assignments;
- When teachers design and set up quizzes, which can be automatically graded, be given feedback, or be shown the correct answer;
- When a teacher and students edit and add to a wiki, journal, blog, and survey facilities; and
- When the resource facility is used to put links to other learning materials such as pdf files, spreadsheets, databases, URL's, books, and video materials, among others.

Along with these activities are the actions that can be done for each of them including add, delete, edit, and upload (Moodle, 2012). The following main elements (or activities) include: *course, quizzes, assignments, forum, and chat, journal, blog, survey, and wiki* (Moodle, 2012). These elements are described in chapter four.

It was necessary to transform the transactional records for this research. Using Excel, a pre-processing data mining procedure was applied by means of a data filtering technique with only the relevant information considered. Only transactions that occurred from June 2011 to March 2012 were considered. The participation of academics and their students yielded a

total of 358,396 records after the filtering process. It was from these records that the needed data for analysis were derived. Essentially, the main logs needed for this research were only based from the academics. Hence, only 42,839 records were used for this research context.

Log data were analyzed using descriptive statistics by getting the average and median values. Analysis was repeated for each of the nine categories (i.e., academic discipline, academic position, gender, usage mode, program level handled, training mode attended, age range, teaching service years, and MOLÉ semestral experience). There were eleven participants who had no computer logs therefore, these participants were grouped separately. All the 22 participants' log data were recorded and further analyzed. The results from descriptive statistics are in numerical values. Consequently, these numerical values needed to be interpreted qualitatively for further analysis. Results of analysis for interactive feature usages are illustrated in Appendix H. For non-interactive features usages, these are presented in Appendix I. Findings from quantitative data are further discussed in Chapter 4, while analysis is presented in Chapter 5.

3.2.3.2 Qualifying quantitative data

In the analysis of quantitative data, particularly the average and median values, the level of interactions (whether high, medium, or low) were assessed. The results of this analysis are presented in section 4.7 of chapter four. When presenting the results, this study interpreted the values in terms of two strength levels: high and low. The values in the medium strength level were spread out decisively to be included either in the low and high spectrum.

3.2.4 **Supplementing mixed data**

This research used the embedded design (Creswell & Plano Clark, 2011) in analyzing mixed data as introduced in section 3.1. The results from both the qualitative and quantitative data were used for probing deeper into the questions being addressed in this research. It is important to note about the terms used – supplementing and corroborating – instead of 'triangulating results'. Urquhart (2013) quoted Myers (2008) and Orlikowski and Baroudi (1991) to use the term 'triangulation' with caution. Thus, rather than triangulating results, this research maintained that primarily concepts were derived from qualitative data and then supplemented with quantitative data to further analyze them. Quantitative data then corroborate the qualitative results. This level of analysis is viewed in the context of theoretical integration which is explained below.

The final outcome from the processed mixed data leads to the fifth component which is theoretical integration as introduced in section 3.2.2. It is the process of comparing the substantive theory generated with other previously developed theories (Urquhart et al., 2010). The sequence as to when theoretical integration is performed seemed to be divergent. In Charmaz (2006), theoretical integration was earlier introduced: in open coding and onwards. In contrast, Urquhart (2010) put forward that it was the final component being ensured – where comparison is made with other theories. Arguably, this divergence is not in conflict with one another because both speak about supporting a theory build-up. On the one hand, Charmaz (2006) talks about how coding is done; while Urquhart et al. (2010) dicusses about the end-product on the other hand the theory – building itself. Both elucidate which answers to "what then", or "so what" after all the processes are applied.

Thus, theoretical integration is a process that is incorporated from the start of the analytical exercise to achieve the highest level of abstraction and by which a substantive theory is defined and compared with existing theories. In this research, theoretical integration occurred as early as in the stage of open coding and then progressing to axial and selective coding. It is in the axial and selective stages where quantitative data were supplemented and where corroboration took place. Consequently, theoretical integration had been achieved in the process.

3.3 Chapter summary

This research methodology chapter discussed the research design and the methods of data collection and analysis. Case study and building theory from a case were discussed and then related to this thesis. The techniques used in this study were detailed in this chapter.

Overall, this research was guided by the eight-step building theory from case study by Eisenhardt (1998). Furthermore, the recommendations of Strauss and Corbin (1998), Charmaz (2006), Urquhart et al. (2010), and Urquhart (2013) were also presented. More importantly, this chapter explained the processes that this thesis has performed to be able to answer the research question posed.

CHAPTER 4

4 FINDINGS

The previous chapter presented the methodology used in this research including the data gathering procedure and the analysis of the qualitative (in-depth interviews) and quantitative (log entries) data.

Even though the use is voluntary, it is interesting to investigate academics' usage of the blended modes of learning environment. The voluntary nature of utilizing the system has created different reactions among the academics. For example, some academics who decided to use MOLÉ are happy about the benefits and conveniences that the system provides. Others feel pressured to use it. Nevertheless, because there is a need to confirm each of these academics' real impressions and feelings towards the system, interviews were carried out as part of the investigation. To supplement the interview data, computer logs were collected to verify each academic's actual usage of the LMS.

In this chapter, the findings from the data gathered are discussed. In section 4.1 the attributes and the background information of the participants are presented. In sections 4.2 to 4.6, the major concepts and dimensions that surfaced from the interviews are described. In section 4.7, the findings from MOLÉ log data entries are illustrated. The log entries findings will be used for triangulation in the latter part of the next chapter.

4.1 Participants' attributes

This section details the participants' attributes. Nine attributes are defined : academic discipline, academics' position, teaching years, program level handled, gender, age, usage mode, training attended, and MOLÉ semestral experiences (for details see Appendix C, and for average and median values pertaining to service years, age, and MOLÉ experiences see Appendix D).

4.1.1 **Academic discipline**

At MSU-IIT, academic disciplines or specializations belong to separate colleges and schools. Each college or school comprises at least three disciplines. For example, Biology, Mathematics, Physics, and Statistics are different disciplines that belong to the College of

Science and Mathematics, while Psychology, Philosophy, and English, among others, belong to the College of Arts and Social Sciences.

The colleges and schools were grouped according to the general observations of this researcher on the subject content and description of the courses for each discipline. The groupings are as follows:

Group A

- College of Sciences and Mathematics
- College of Engineering
- School of Engineering Technology

Group B

- College of Arts and Social Sciences
- College of Education

Group C

- College of Business Administration and Accountancy
- School of Computer Studies
- College of Nursing

Courses in group A have a higher percentage of analytical, practical, and problem solving subjects compared to group B, which has a higher percentage of descriptive subjects. Group C courses have mixed type presentations in classes, which commonly deal with cases studies, problem solving, or descriptions. Grouping schools and colleges is necessary for comparison purposes in this study.

The three groups are shown in Table 4-1 with different colleges or schools in each group.

Table 4-1: Academic disciplines

Academic Discipline	Participants (33)
A. Engineering, Engineering Technology, Sciences, and Mathematics	11
B. Arts and Social Sciences, and Education	11
C. Business, Nursing, and Computer Studies	11

4.1.2 **Participants' positions, programs handled, and gender**

As shown in Table 4.2, academic positions are divided into two groups of participants: with administrative load, and with no administrative load (henceforth, administrator and non-administrator respectively).

Table 4-2: Academic position, programs handled, and gender

Academic Position	Participants (33)
With administrative load	12
With no administrative load	21
Program level handled	
Both undergraduate & higher degree (HUD)	18
Undergraduate (UG) only	15
Gender	
Male	16
Female	17

An administrator performs administrative functions that may range from a course coordinator to the highest level of administrative positions, such as the Chancellor of the university, system administration, and MOLÉ trainer positions. Twelve participants are administrators, while 21 participants are non-administrators. As academics, they are required to teach for a number of hours depending on their administrative positions, and to perform the duties assigned to them as administrators. For example, a college dean is required to teach three units (equivalent to 3 lecture hours) while twelve units per week are allocated to the administrative duties. Non-administrators are academics who solely deliver instruction that includes lectures or a combination of lectures and laboratory. They are required to conduct classes for an equivalent of fifteen units, or a maximum of 21 hours per week.

Table 4-2 also illustrates two levels of student cohorts: collegiate or undergraduate degree (UG) students; and graduate or higher degree (HD) students that are handled by the participants. The UG courses are handled by 15 participants while both the undergraduate and higher degree courses (HUD) are managed by 18 participants.

In addition to academic position and program level handled, Table 4-2 shows the gender with almost a balanced number of participants, wherein 17 are females, and 16 are males.

4.1.3 **Age range, teaching years, and MOLÉ semestral experience**

In Table 4-3 two age ranges are shown based on a 20-year interval.

Table 4-3: Age range, teaching years, and MOLÉ semestral experiences

(See appendix D for details of average and median values)

	Participants (33)	**Average**	**Median**
Age Range			
25 to 44 years old	15	31.33	30.00
45 to 65 years old	18	57.78	59.00
Teaching Years			
1 to 15 years	14	6.64	6.00
16 to 30 years	9	23.00	20.00
31 to 45 years	10	38.20	38.00
MOLÉ semestral experiences			
0 semesters	6	0	0
1 to 10 semesters	20	6.61	6.00
11 to 20 semesters	7	16.50	16.00

The first group, which has 15 participants, is aged 25 to 44 years old with an average age of 31.33 and median of 30 years. The second group has 18 participants with an age range of 45 to 65 years old and an average of 57.78 and median of 59 years.In terms of the length of teaching service, the participants are divided into three groups based on a 15-year interval, which is also shown in Table 4-3. The first group, with 14 participants, has an average of 6.64 and a median of 6 years. On the other hand, the second group with nine participants averages 23 with a median of 20 years in service. Finally, the last group with ten participants has an average of 38.2 and a median of 38 years in teaching service.

In addition to age range and the length of teaching service, Table 4-3 also shows three group divisions of MOLÉ semestral experiences. The first group comprises six participants whose experiences are nil or inconsiderable. Twenty participants in the second group have either one, or up to ten semesters of MOLÉ usage experience, and an average of 6.61 and median of 6.00 semesters. Of the 20 participants, five academics have used MOLÉ, however, they decided to stop using it after some time, for different reasons. Consequently, they used either one, or a combination of alternative systems like *Facebook, Wiki Space, Google Docs,* EDMODO, and email, among others. Finally, the third group, which comprises seven

participants, have either eleven, or up to 20 semesters of usage experiences and an average and median values of 16.5 and 16.00 respectively.

4.1.4 Usage mode and training modes attended

The usage mode has three groups: MOLÉ only, supplemented, and alternative modes. As shown in Table 4-4, the first group according to usage mode implies that 16 participants use MOLÉ only as a complement to their traditional classroom instruction.

Table 4-4: Usage mode and training mode attended

Usage Mode	**Participants**
MOLÉ only	16
Supplemented	6
Alternative	11
Training Mode Attended	
Attended training	22
Self-trained	9
Untrained	2

The second group with six participants, supplemented MOLÉ with other systems (e.g., Facebook, WIKI, etc), while the third group has eleven participants who did not use MOLÉ during the data gathering period.

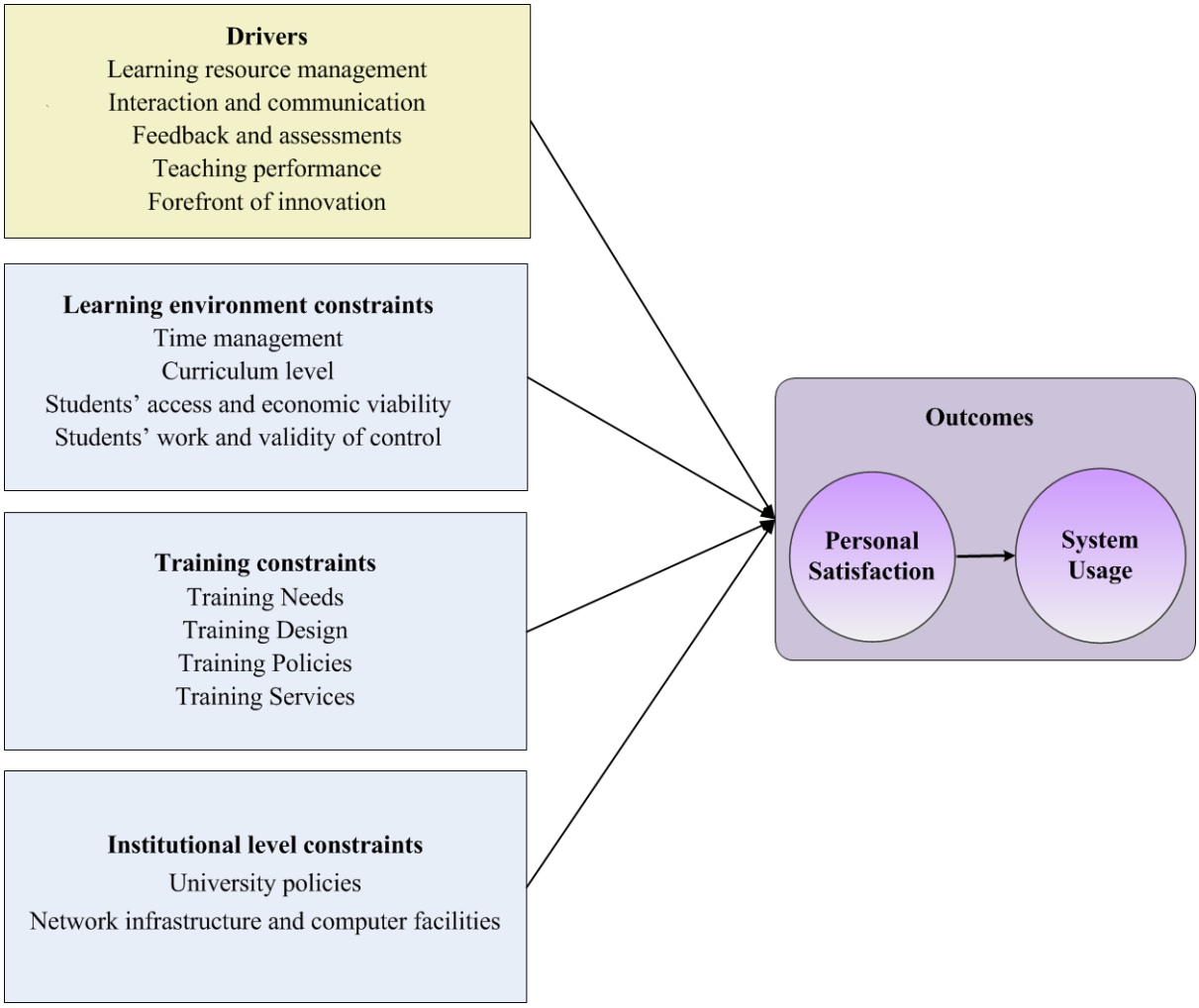
Participants were also asked what mode of training they underwent. As shown in Table 4-4, 22 participants have undergone training, and all of these participants use the MOLÉ in their classes. The second group has nine participants who self-trained. They chose to use the system even though they had not undergone training. The last group has two participants who have neither attended training, nor self-trained. Apparently, they have not used MOLÉ in their classes, although they use other alternative systems.

4.1.5 Summary for attributes

The previous section shows that there is a good balance of participants across the different attributes or categories. The grouped data are useful when comparing the references made for each of the themes, and when looking at the relationships that occur when cross-referencing.

Out of the 273 themes loosely coded from the interview transcripts, the themes that had similar or the same meaning was categorized into five major concepts and seventeen dimensions shown in Figure 4-1.

Figure 4-1: Concepts and its dimensions



These concepts (drivers, training constraints, learning environment constraints, institutional constraints, and outcomes) are elaborated below.

4.2 Drivers

Academics have varied reasons that inspire them to use the system and integrate it in their traditional classroom instruction. These motivators are called drivers in this context. Drivers are motivators that encourage academics to sustain their usage of MOLÉ. While some

academics have been influenced by others who have heard about the advantages of using it, most of the participants reasoned that their motivation for sustained usage is due to their positive experiences with the features of the system.

Primarily, convenience is the motivator for the sustained usage of MOLÉ. Participants have found that the MOLÉ system offers helpful and manageable features that enhance their teaching services, such as managing learning resources, interacting with and managing their students outside class time for consultation, conducting exams and quizzes, and giving feedback, among others. Consistent users claimed that because of their system use, their teaching performance had improved.

The interviews yielded a total of 334 references for the drivers. These references were categorized into five dimensions as shown in Table 4-5.

Table 4-5: Dimensions of the driver concept

DRIVERS	Sources (33)	References (334)
Learning resource management	23	77
Interaction and communication	22	99
Feedback and assessments	20	66
Teaching performance	19	47
Forefront of Innovation	23	45

Furthermore, the five dimensions were grouped into two positive theme categories, namely: (1) system facilities, and (2) affect, i.e, behavioural. The first three dimensions (learning resource management, interaction and communication, and feedback and assessments) are related to system facilities; and the last two (teaching performance and forefront of innovation) relate to affect. Each of these dimensions is detailed in the sub-sections that follow.

4.2.1 **Learning resource management**

Learning resource management is one of the dimensions of drivers, and refers to themes that signify the capability of the LMS to perform its system task. It allows users to make use of the learning resources and manage these materials. MOLÉ's usefulness as an effective learning resource manager was expressed by 23 academics. Their positive experiences using MOLÉ include its usefulness for resource accession–that is, being able to access resources

anytime, anywhere; re-usability of learning materials; and convenience. Other themes with similar or related meanings are also categorized in this dimension. These include allowing for storage or repository of materials, uploading and downloading of files, and retrieving files.

On resource access, for example, academics found it simple to use MOLÉ to upload their lessons and course materials. Subsequently, academics directed their students to access the lecture notes, syllabi, and class announcements online. Additional notes that were not taken up during lectures were also uploaded in MOLÉ. Once uploaded, academics could choose to put control mechanisms such as access rights, or submission deadlines for assignments. The advantage of keeping materials ready and available in MOLÉ is a new technique that most academics found to be advantageous in improving the conduct of their classes. One of the participants shared:

> *I did away with the reporting system in the graduate school, at least, in my class. Before, the style was, for every reading, students do a report. That's gone now. What I do is to announce in class that the reading material is available online. #17*

Academics could also easily direct their students to refer to their learning resources, which gave them ample time to be more prepared for their classes. As attested by an academic, students have positive reactions in such a way that they become more participative, thus acknowledging: '*…they can ask better; they can laugh more.' #19*

Convenience and availability or 'always present' are the two most often cited motivators for some academics to use MOLÉ. Convenience relates to easy access of materials anytime and anywhere. Thus, academics did not need to bring heavy books, they could avoid printing the lesson materials, or they could minimize time going to the library. In addition, it was convenient for some to use MOLÉ because they could also perform their academic responsibilities outside the classroom, especially for administrators who had official travel.

> *Where [sic] more than usual because of my official travels, I can always upload or download information related to my class while I am on the go, and can check their work anytime I want to. #2*

The usefulness of MOLÉ, which is perceived as an efficient managing tool, enables academics to do other tasks, such as preparing modules or improving existing materials to be re-used as materials for another class, or another semester.

Academics have to be creative in preparing the instructional materials further, and need to be familiar with the type of activities that they can conduct in MOLÉ. They also have to be familiar with the resources that can be incorporated into their online classes, like website links, YouTube clips, and other multimedia resources. A participant shared that such resources (when necessary) could enliven the class, and make learning more fun.

One of the challenges encountered by most participants is in relation to the process of developing learning materials that are made online-ready and useful as a learning resource. Considerable time for preparation has to be spent when incorporating resources into their classes. Issues and challenges in preparing materials for online use are detailed in section 4.3 – learning environment constraints.

4.2.2 **Interaction and communication**

Communication tools are available in MOLÉ that allow users to communicate in synchronous (real time, e.g., chat) or in asynchronous mode (e.g., threaded discussion, wiki, or blog). Academics and students can interact with each other and communicate about their lessons beyond their face-to-face classroom settings by utilizing chat and discussion forums.

Academics who have utilized the communication tools observed that their students were more participative online. They noticed that personal interaction was enhanced in MOLÉ compared with the traditional setting. In some instances, when they ran out of time in their traditional classes, some academics arranged to extend their class discussions with their students online at an agreed time. This arrangement was done in both the undergraduate and graduate classes. Students could also consult one another online. The novelty of being able to exchange ideas was appreciated by most academics. In addition, the use of MOLÉ appeared to encourage the students to consult with them without feeling embarrassed or humiliated. They observed that it was a very effective tool for allowing people to relate to each other, relay their opinions, and give feedback on the comments of people and their discussions. One academic shared:

> *This is something which cannot happen always in the traditional classroom because of the limited time. I think that's the most beautiful thing about online discussion forums. That is where I am quite interested – as to how much [a] student's learning because they are able to exchange opinions. # 18*

Lessons could be enhanced using journals, blogs, and wiki where interaction is also possible, using these features. Hence, the use of MOLÉ promotes interaction and communication.

I let my students create a blog. My requirement is for at least, once a month they will have an entry #23

I can check their blogs, their activities, to monitor them. #15

MOLÉ has certain features where my students can critique the work of others. I use Wiki to let my students post their projects. # 9

Twenty two participants considered these features as effective tools that help improve their interaction with students. Likewise, they found it helpful when giving feedback to their students.

Some academics who had been using MOLÉ for quite some time have already learned to communicate effectively with their students online. Even for urgent matters, some academics welcomed the idea that students could approach or contact them online.

[I]f it's a matter of life & death and you see me online you can always interfere and chat, and I can answer your questions. If not, then sorry, I will also tell you. #2

Interaction was acknowledged to improve the teaching and learning process because topics for discussion were not confined to the traditional classroom. One academic shared that students' interactions and discussions were assessed and graded.

I let my students interact with their classmates so that they can learn from each other. They posted their comments and feedback for the topic discussed, and I would have some kind of grades from the posting of their classmates. # 22

The benefits that have been identified motivate most of the academics who patronized MOLÉ. Although there were some challenges that they were aware of, some academics believed that the system helped them in their teaching, as well as their students' learning:

I said to my students: 'at this point there is no longer one being absent or present in class because 24/7 I will always be behind your backs.' # 31

However, there were some who encountered difficulty in using the communication tools, or felt challenged when it came to interacting with their students because they believed that they were deficient in pedagogical techniques. For example, with several students in classes of more than ten students, it was difficult for some academics to manage the discussion forums. Moreover, because of the absence of visual cues, it was a challenge as well to interact with their students. Most academics were not confident about what approach to apply in such circumstances.

On the other hand, some academics opined that there were cases where their students felt challenge – realizing that their teachers served different roles – i.e., as facilitators – unlike in traditional classes. Nevertheless, some academics were positive that their students would benefit from this mode.

4.2.3 **Feedback and assessments**

The third major system task that a LMS is capable of, is feedback and assessments. Themes that are related to scoring quizzes, tracking performance of students, preparing exams, implementing them, and visualizing results are categorized in this dimension. Twenty academics expressed their appreciation in relation to feedback and assessment.

More specifically, the feedback and assessment feature was aided by the computer logs and data visualization, thus allowing academics to be informed about students' interaction with the system and knowing who had accessed the learning resources. For example, on assignments, academics were happy that they could track and monitor their students' submission date and time.

Another convenient feature relates to validating test questions. Academics can assess whether the test item is valid or not, by looking at the item analysis.

> *If majority of the students are not able to get the correct answers for a test question then you have to delete the test item for the next batch. If the percentile of the students is very high, you retain the question. From time to time I replace the question. I delete the questions that are not getting good responses. #28*

For exams and quizzes, many academics expressed their positive views in relation to the scoring feature of the system. Academics were pleased that the system was convenient to use because test scores could be displayed immediately after students had submitted their answers. With this capability, academics could keep track of the performance of their students. Academics were able to give their feedback on the answers of the students. Apart from the convenience to the academic, students themselves could also keep track of their own performance by looking up their own scores.

Most participants inferred that it was convenient on their part to use MOLÉ for exams. However, some did complain of the lengthy process for creating exams. Particularly, the drawback was in preparing the questionnaires and the feedback that had to be incorporated. Academics had to develop the multiple choice questions using the specified table of

specifications for the exam. Also, they needed to allocate time to incorporate feedback for each of the items, and the reasons for the correct or incorrect answers.

> *The good thing about MOLÉ is that you'll be able to get the score of your students after they take the exam. That's the convenience. However, you have to make an effort to create the questions prior to the exams. #06*

Although there are challenges in preparing test questions and feedback, academics expressed their enthusiasm to use this feature even though not all of those who expressed their appreciation had actually used the feature. Some of them had undergone training and workshops, but they had not yet fully explored and applied to their classes what they had learned from the training.

4.2.4 **Teaching performance**

Themes that are categorized and grouped in the teaching performance dimension refer to how MOLÉ aids in the delivery of lessons, which results in better or improved teaching performance. Using MOLÉ helps academics perform their tasks more efficiently. The convenience that the system offers gives academics more time to reflect on their lessons. Besides, it is an effective tool to complement the traditional classroom.

> *Now, I am truly just facilitating, because I have all the materials uploaded in MOLÉ… I think for one, I have seen the potential – for really improving teaching and learning. It's a good complementation because I realized that it is still difficult to offer a purely online – it's a good complement to a classroom setting. # 17*

This participant came to a point when he experimented with a blended setting in an actual classroom situation (utilizing a computer laboratory for this purpose). Instead of requiring a student to answer some questions to the issues asked in the traditional way (by vocalizing the answer), he required the students to type their answers using the journal feature in MOLÉ, where he posted the questions. With such facility, he could readily see their answers; and in the same manner, whatever students verified, or when they requested further explanation from him, he could explain. In effect, the teaching and interaction with the students was instantaneous and individualized. This participant opined that MOLÉ worked to the advantage of the student, while the academic would be able to assess the capability of each student:

> *So by just browsing at their answers, without anybody knowing it, I know the frequency of responses – the similarity, or what's different, and at the same time,*

somebody who I know that does not talk often, I'd be surprised, and would discover that this timid student is quite good in writing. #17

Most participants who had positive comments about MOLÉ were regular users who had experienced the benefits of the information system. They used the system to complement the traditional mode of delivery. They attested that using the system improved their teaching, as manifested by the results of their teaching evaluation. Similarly, they shared that facilitation had become very efficient because students were more ready to participate in classes, having the learning materials in MOLÉ.

Likewise, participants with administrative functions who used MOLÉ were thankful that their attendance was not adversely affected when they had to travel unexpectedly. They did not have to miss classes, given that they could require students to refer to MOLÉ for the lessons of the day, and classes were continuous because class activities were already detailed.

Academics were happy that they could augment the resources that were not available in the library. A participant commented that it was a practical way of reaching out to students because there would no longer be the excuse that there were no available textbooks.

There were also some participants whose happy experiences motivated them to advocate or promote the use of MOLÉ. They hoped that other academics would use the system because the system was free. They also looked forward to their colleagues, their students, and the university as a whole, recognizing the importance of the system as a tool to improve delivery of education. More importantly, these participants aspired to expand their own usage and wanted others to do the same. A much younger participant expressed eagerness over MOLÉ use; along with one of his colleagues in their department, he organized a weekly training for others.

I am very pro-MOLÉ; so my dream is that all faculty members of our college will know how to use MOLÉ. I want them to experience my experiences. MOLÉ is beautiful. For me it is a very productive tool. # 26

A few participants used the system more often during tests, rather than posting learning resources online. Their reasons were similar – that it had lessened the burden of checking papers, and that they could focus more on preparing their lectures and class presentations.

Some participants were concerned about their attendance in classes, consultation periods, and extending classes beyond schedule. They said that MOLÉ was helpful in extreme cases that they had to be there for their students. Also, advising students about their class performance

was easy for some academics because they encouraged students to communicate with them using email or chat.

4.2.5 **Forefront of innovation**

Themes that referred to the effect on academics' emotional and psychological behaviour brought about by technological developments are categorized in this dimension heading as forefront of innovation. Being at the forefront of innovation suggests that technological developments are welcomed and embraced as tools for advancement. There were 23 participants who cited that they were motivated to use technological developments. It gave academics a feeling of pride to some degree.

> *I was really excited because I know that not all schools can do that, not all teachers can do that. Not all schools can provide the LMS. #22*

Being *'at the forefront of innovation' (#2*) is seen as an advantage in terms of new strategies in teaching and learning. An administrator asserted that, as a leading university, it is an advantage to venture into an alternative mode of teaching and learning because of richer or higher potential in the educational arena, such as establishing linkages with other universities for scholarly exchange and research.

Also, being at the forefront of innovation helps the university reach out to the compelling needs of the nation in developing its human resources. There are programs that are offered in the different colleges and schools and at different program levels that can benefit the most from MOLÉ. For example, in the graduate program on Sustainable Development Studies, most students are government employees who are challenged most often in traveling to the university campus. Because of such encumbrance, the best way possible for them to get in the program is to offer the courses online, according to an administrator. Likewise, MSU-IIT has several graduates who finished the three-year engineering technology program. According to one participant that with MOLÉ, continuing online programs for most graduates can be accommodated.

> *I think we really need to move on with developing online programs, because there is still a demand for it, especially with our Engineering Technology graduates. We cannot just leave these graduates – those in Canada, and other parts of the world – hanging, because there is very much a need of skilled manpower in their workplaces. #22*

For most participants, using technology is a new paradigm that contributes to one's development despite the challenges they experience while acquiring the skills to use MOLÉ's features. The benefits from technology could be a motivation for others to use the system. However, some participants are cautious about their attitude towards technology.

The eagerness to learn and the satisfaction of having learned new things were attested to by several participants. This was summed-up by an administrator, saying:

> *The most important thing is the initiative, and motivation to learn. If one does not want to learn, nothing can be done about it. If one enjoy[s] learning new things, that would not be a problem. But that cannot be said of everybody. There are those who would rather take the path of least resistance approach such as doing what has already been tried and tested. #2*

Overall, the dimension discussed is about positive attitude towards technology, for which the term 'forefront of innovation' was borrowed from one of the participants. This research is not confined to the positive emotions brought by being at the forefront of innovation though. There are more dimensions that affect the satisfaction level of using the system in a voluntary situation. These dimensions are discussed in the latter sections.

Convenience was mentioned as the most common driver and motivator among the participants. This motivator, which made interaction with the system easy for most participants, indicates that the benefits of using MOLÉ outweigh their decision to use, rather than not use, the system.

Apart from convenience, themes that were commonly cited by the participants were related to the features that they, as well as their students, could use to their advantage. These features allowed them to manage learning resources, interact and communicate with students, and give feedback and assessments more timely. Nonetheless, most of the participants were using technology, and did not keep the knowledge they had acquired to themselves. All of them said that the system was useful and the hopes were high, except for some glitches in network infrastructure, and the challenges that were initially mentioned. They were happy to share some strategies that they had experienced with MOLÉ usage. For them, the new learning paradigm was advantageous, but most of them agreed with the notion that they needed to be disciplined in managing their classes. Essential class guidelines needed to be established, which students had to be aware of.

4.2.6 **Summary for drivers concept**

Overall, most participants commended and affirmed the benefits of MOLÉ. Some of those interviewed who had not used, but were aware of what MOLÉ was about, also commended it. Participants who were non-users said that they were, in fact, knowledgeable about what the system provides, however they did not have the keen interest, and did not want to get out of their comfort zones. Likewise, participants with neutral attitudes were also aware of the benefits that could be gained, however they had personal encumbrances that prevented them from using MOLÉ.

Varied attitudes toward the system are further investigated in the succeeding sections. This study has identified three environmental constraints, namely: learning environment constraints, training constraints, and institutional constraints.

4.3 Learning environment constraints

Learning environment constraints is one of the three environmental constraints, along with training and institutional constraints. The concept of learning environment constraints discusses themes that refer to issues and challenges in teaching and learning in the blended learning environment.

As shown inTable 4-6, there are four dimensions comprising this concept: time management, curriculum level, students' access and economic viability, and students' work and validity of control.

Table 4-6: Dimensions of the learning environment constraints concept

LEARNING ENVIRONMENT CONSTRAINTS	Sources (33)	References (278)
Time management	25	92
Curriculum level constraints	27	75
Students' access and economic viability	21	66
Students' work and validity of control	20	45

Each of these four dimensions is discussed in the sub-sections that follow.

4.3.1 **Time management**

The time management dimension comprises four themes of related issues: preparation of learning materials and tests, implementing the course, contact hours, and compensation. These issues were referenced by 25 academics in the different aspects of this dimension.

According to most participants, preparing the materials was more time-consuming compared to a traditional classroom because the task constitutes not only writing lesson notes, but also choosing the relevant links for the materials that can be used to support the lessons. They said they needed to guide students in the use of resources, making sure that the materials were useful and not deviating from the principles and flow of their topics. They had to be creative and devote time to creating modules. Although some were passionate to create modules and deploy learning resources in MOLÉ, they recognized the challenges of the process.

On the other hand, some participants believed that it would be beneficial to their students if multimedia-enhanced and interactive materials were incorporated in their lectures. Likewise, it would be advantageous to their students if their actual lectures were video recorded and uploaded to MOLÉ. However, time to prepare was constrained, and the necessary equipment (e.g., good quality video recorder and tripod) were not available in the classrooms. With a video lecture uploaded, the students could view the lecture several times, which may help them understand the concepts or topics better.

> *I believe lecture can be done, like having a video of me discussing. I believe that will be worthwhile because the students can visit it again and again. And with that, students can have a better idea how things are done. I think we just have to be creative. It is only the time that we lack. #9*

> *The module has to be prepared – you have to think ahead. Of course, before you launch it, you need to test. You have to check it. Preparation is a process which consumes time. That is the challenge – because there are times that you have to do it overnight for it to be deployed. #23*

While most issues were related to the effort exerted and length of time spent on developing the modules, a particular issue that participants were concerned about was assessing the learning outcomes of their students. This concern was raised by some participants, because the next essential step after materials were deployed, was to observe and assess the learning outcomes of the students. By assessing the learning outcomes, necessary improvements on the learning resources could be determined. One participant expressed that assessing learning outcomes for the blended mode was a challenge because of lack of time:

> *Perhaps if the teacher has spent so much time on preparing the module it could have been beneficial. Now it is just a matter of finding out if the students learned from the modules. How then can you improve the modules? … Sometimes we don't have time to really analyze how the improvements can be done. #12*

Implementing a web-based course is time-consuming if the academics agree with their students that they can discuss their lessons online. This entails using the communication tools such as chat and discussion forums. Likewise, participants who used a teaching strategy like journals found it time consuming to read each entry from the students in big classes. Thus, they sought time-saving techniques that would allow them to communicate efficiently using these tools. They believed that they needed training to enhance pedagogical skills for online classes.

Contact time and compensation is another issue. An academic's weekly presence requires three hours of actual contact hours, i.e., class time. At MSU-IIT, full-time academics are required to render an equivalent of 40 hours per week that includes actual contact hours, consultation with students, lesson preparation, and related tasks. An issue arises when academics conduct a blended class using MOLÉ for half the actual contact hours (one and a half hours instead of three hours) online, and the other half in the actual classroom.

> *[B]ecause I know I can substitute the one and a half hour with an online session, how can that be documented and treated as a contact hour? #17*

> *It is time-consuming. It demands more time than the traditional classroom. In fact, it seems like double the effort, that's my feeling. …Somebody handling online courses should be well compensated – double pay, perhaps. #14*

Overall, participants implied that a reduced teaching load may be necessary to enable them to develop better learning resources and be motivated to use MOLÉ. The study has found that some participants were not motivated to use the system because of time constraints. They claimed that creating modules for blended learning was doable but the time to develop the learning resources was lacking. Some participants proposed a reduced teaching load so that they could allocate more time to developing the modules.

Issues related to time management are strongly linked to university policies. These include compensation and teaching load schemes. University policies are discussed in a later sub-section on institutional level constraints.

4.3.2 **Curriculum level**

Curriculum level constraints are related to the subject or the course handled by a participant. The curriculum level dimension has two elements. On one hand, program level includes teaching strategies that can be used in the hybrid learning environment for either the undergraduate or higher degree courses. On the other hand, both course requirements and course description describe the essential components for a specific course. The overview of the subjects generally includes specific objectives for the learning activities, and the expected learning outcomes for each course. These are defined succinctly in course requirements and course description.

Of the 27 participants, there were 13 who implied that the issues were related to program level. Most of these participants mentioned pedagogy in one or both program levels, work responsibilities, and travel incurred when taking a higher degree course at MSU-IIT.

> *There are courses in our university like the Masters in Business Management whose students are mostly in the working group. Usually they are only available at night, or during weekends. ...I see that as opportunity. I think it is the course that best fits the online mode of delivery. #5*

> *MOLÉ is very useful especially for the graduate students. Because I have graduate students from different places - far away provinces, i.e., from Zamboanga and Davao, so they wanted to have our lectures on MOLÉ. But for the undergrad, I don't know. Maybe it's because of the connection problems. #33*

Although participants found MOLÉ useful in some aspects of the graduate level, they also opined that students were having difficulty because of lack of computer skills, and the acceptance level of the students. For example, some academics found the basic need to orient their students to technology use before formal lessons were presented and deployed online. Yet, another academic expressed his despair when he realized the number of graduate students in his class dwindled in number because students feared his course. This participant reckoned that the issue was because of age and the nature of his graduate course.

> *In the last few years nobody is enrolling in the course anymore. Perhaps the reason could be that those taking this course were more or less 'past their primetime' already. Sometimes also, because students perceived that the subject is a bit technical such that they felt they need to have engineering background in this course. #1*

> *Most of my undergraduate students requested a hardcopy of our lessons and they insisted on using the conventional one, so that's why I also changed the mode of using the MOLÉ. But for my graduate students it's so good – smooth learning online. #33*

> *For graduate students, the orientation they needed is more on giving them hands-on activities before you can fill-in what topics to discuss. Sometimes, students get lost in their interaction with the interface #12*

In general, most participants were concerned that undergraduate and graduate level students may need different teaching strategies in the blended mode.

Another issue is in relation to course constraints. Course constraints experienced by academics are important themes in this research because participants raised these issues in relation to their affiliation with a specific department, school, or college. The teaching load given to each academic relates to the course description and the requirements for such courses. In MSU-IIT, a course is a single subject that an academic handles. A single course has a total equivalent of three academic units. For example, one of the courses in the School of Computer Studies is Human Computer Interaction (HCI) which is described as a socio-technical course with a two-unit lecture, and a one-unit laboratory. A one-unit laboratory component means three hours of actual laboratory activities. Likewise, descriptive courses which are commonly offered in the Social Sciences, such as Philosophy, Humanities, and Sociology, are three-unit courses that do not have laboratory components. Moreover, highly computational and technical subjects such as Engineering courses have either computer or practical laboratory components.

Courses that have a computer laboratory component as a course requirement, such as those in the engineering, sciences, technology, education, and information and computer science fields, do not have the same problem as the arts and some business subjects. Seventeen participants commented on the issue relating to courses without laboratory component. They said that without a laboratory component of their subject it was difficult for them to decide to use MOLÉ because of the limitations on access to computers–for themselves, or for their students. Most of the comments in this area were related to availability of computer facilities.

> *We have to fit in on what schedule is vacant. We cannot just schedule our exam during our class schedule because we have to look for an available laboratory. Sometimes we cannot accommodate all the students in a class. The university management needs to provide laboratory for such a purpose. #14*

> *I cannot use MOLÉ when I am in class. I suppose I should show them how to navigate with MOLÉ but since we do not have connection in the classroom, I could not show them the real thing in online class. That is still one of the problems - the connectivity #25*

I used the quiz facility but the problem is I cannot bring together the students at the same time, besides we don't have enough facilities to have all 45 students using 45 computers. #28

These reasons from the participants are issues because without computer laboratories or the necessary facilities in the classroom, academics cannot use the intended teaching strategy for the course. Without a computer laboratory, participants said that it was difficult to require all their students to access the learning materials online. Some participants wanted to have their learning materials in MOLÉ and once uploaded, they could access it in their face-to-face classes to demonstrate some concepts during the lecture. Also, using MOLÉ to conduct exams in a common laboratory was an issue for most participants because they wanted to make sure that they were present and could watch over their students answering the tests. These issues about tests are mostly related to three elements: validity, reliability, and trust.

Course description as a constraint relates to the type of presentation that is best for a particular course. Overall, participants from problem-related or computational courses said that their subjects were different from descriptive subjects, and that teaching strategies were much different. This is an issue because of the varied interaction levels that academics have to perform.

For this constraint, 12 academics commented that they needed to have a different method of interacting with their students because their courses were problem-based. Participants emphasized that it was important that sample solutions to the problem needed to be discussed with the students face-to-face. Most of them suggested that descriptive subjects would benefit more from MOLÉ.

Before proceeding to a problem I have to discuss the problem with my students face-to-face whether the solution would be appropriate for his/ her requirement. #6

Perhaps it did not fit on the mode of delivery that I use. Otherwise, if I see it advantageous to use, I could have used it. My day to day subject is more on computation, and use of computer software. #8

But as with my subject now, I guess I can use least MOLÉ. It's because, the subject is more on calculations and then solving. I think it's easier if it's written, to check, rather than submitting it online. #10

It's a different experience if you can see your students compiling a program. I don't know how to integrate it to MOLÉ. I think that's a challenge also for technical requirements in programming courses #24

The general notion is to choose what course is ideal for online delivery. There needs to be specific guidelines on what type of courses will be complemented by the use of MOLÉ.

> *One must be familiar with the type of activities that you can conduct in MOLÉ, and also the resources that you can incorporate into the class, like website links, YouTube clips, and other multimedia resources. #5*

> *We're trying to propose for a set of policies governing online teaching. And one of the basic requirements or one of the basic components of one policy is that only the department can determine which subjects should be taught online. And this should go through a process determined by the policy makers. #18*

The comments gathered mostly referred to issues, although there were solutions that academics suggested based on their personal judgment, that is, whether to use the system or not for their specific course. The decision to use could depend on the academics themselves, which may be termed the teacher factor.

4.3.3 **Students' access and economic viability**

There are two issues related to student constraints. Student constraints are not about the students. Rather, they are about the effect on the teacher as transmitted by the students' use of MOLÉ. There are two issues identified: access and economic viability, and work validity and mode of control. The first issue is discussed in this sub-section, while the second issue is discussed in section 4.3.4.

Most of the 21 participants were concerned with the equitable access of students to MOLÉ because a large percentage of students were economically challenged. Since most students do not have their personal computers, their non-access to technology was often considered by academics as a factor that affected their teaching performance; more so, when academics suggest to their students to access materials online. This study shows that economic viability hinders most participants from using MOLÉ.

Economic viability constrained participants when deciding whether to pursue using MOLÉ or not. While they were open to using it, the problem that most of them encounter was access. Secondly, participants were concerned about the security of their students who needed to go to internet cafés to access their learning resources online. The danger in students going out to get access at an inappropriate time was constraining to most academics.

> *The majority of the students are poor. So how can you enforce or how can you ensure that instruction can be done online with a set of poor students? #18*

> *It is a challenge that students do not own a computer and sometimes I am scared because if the student will go out of his or her boarding house at night, I am worried. What if something happens to or from the Internet café? That is scary; and what if it was my class requirement this student was working on and yet we do not have the policy for online delivery? We can't really force the students to access the Internet. #5*

In some of their classes, participants gave instructions to their students to share their computers with those without. But they could not rely on this indulgence, 'unless the camaraderie is very close, and that they can borrow from others,' shared one of the participants. Hence, this is a dilemma that participants experience even if they wanted to use MOLÉ:

> *If you take the teacher in the context of the whole situation, the teacher's role is so important, and yet that role may not be fully performed if you have a set of students who are economically unable to get a computer. … Outwardly, what you see are students who are able to catch up. But there are those who don't have – who cannot have access to computers. #18*

Many of the complaints were in relation to access of their students because of economic reasons. Most students did not have their own computers. If they did have their own computers, most did not have internet connections at home. Even some academics had the same problem.

The problem of student access was a challenge that most academics face. Enforcing the use of MOLÉ for their courses made it more difficult for others. This constraint is a university–wide problem related to policies which academics cannot solve by themselves.

4.3.4 **Students' work and validity of control**

The major issue on students' work and validity of control is particularly related to scheduled online tests, and to assignments being required in the course. These are the issues mentioned by the majority of the 20 participants. Yet, participants whose courses have no computer laboratory also welcomed the idea of deploying tests online. However, the issue about no computer laboratory arises because they cannot personally supervise their students who have to take the test either in internet cafés, their residences, or open laboratories. The participants' main issue was the validity and the veracity of their students' answers. They could not simply trust that their students would genuinely answer tests by themselves.

> *I have that trust, but I always validate it in the end by letting them appear to re-echo in the class so that I would then be able to discover whether they have copied. #1*

I trust the MOLÉ, but I cannot simply trust the students. Because while taking the exam students can open other search engines, google, or they can open, and research for some answers. So I have to be there to supervise. #3

How can we prevent our students from not accessing Google when answering? That is an issue, because basically, MOLÉ is in the Internet. #5

In the same manner, participants were anxious about online participation of their students in the event that online learning was formally mandated as an alternative delivery of instruction. This is in relation to control mechanisms such as cross-checking who participated in online activities, which one administrator said was another challenge when delivering online lessons.

4.3.5 **Summary for learning environment constraints concept**

Participants' decision to use MOLÉ was influenced by the situation they were in. In the previous section (4.2), participants talked about the benefits they got from using MOLÉ, whereas, in this section, the constraints of the learning environment are scrutinized.

The table shown at the start of this section depicts the number of participants claiming that the four constraints--time, curriculum, students' access, and work validity--influenced their satisfaction level, which then affected their decision to use MOLÉ. Some of the participants decided to use other alternatives instead of continuing to use MOLÉ because of these constraints. Yet, a few of the participants were fully aware of the benefits of MOLÉ but they were not enthusiastic to use it because they found other systems easier to use; besides, they said that they lacked training.

Training is the second environmental constraint in this study. The training constraint concept discusses four dimensions, which are expounded on in the next section.

4.4 Training constraints

Training constraints deal with the issues and challenges of training needs, design, policies, and services. Training needs look into the issues related to the lack of training in the use of MOLÉ's features, especially the use of advanced tools. Also, issues of the students' lack of skills, which affected academics' MOLÉ usage, are also taken up. Design relates to issues that participants believed are ineffective. Suggestions from the interviews were gathered. Policies are issues that relate to how training is implemented in the university. Services talk about problems experienced by the users and what necessary services should be catered for

academics and students. As shown in Table 4-7, there are 275 references cited by the participants for this training constraints concept. Each of the dimensions shown in the table is discussed in the subsequent sub-sections.

Table 4-7: Dimensions of the training constraints concept

TRAINING CONSTRAINTS	Sources (33)	References (275)
Training needs	29	126
Training design	17	59
Training policies	21	68
Training services	11	22

4.4.1 Training needs

One of the dimensions of training constraints are training needs, which look into the issues relating to the lack of training of academics in various skills. Skills-related issues were cited by 29 participants, and include usage of the basic and advanced features of MOLÉ, pedagogically-related, and students' usage skills.

Participants look into the issues of usage skills from different perspectives. On one hand, those who had the basic usage skills wanted further training in using advanced features. On the other hand, some participants who had undergone basic training and had learned to use the advanced features were mindful about other academics' usage skills. They looked forward to other academics or colleagues in their department being trained so they could experience the benefits of using MOLÉ.

> *In using the MOLÉ what is really important is to train the users, especially the teachers how to navigate the MOLÉ itself. #3*
>
> *I had a hard time using and learning MOLÉ because there are features that are new. Perhaps, if I have enough time to do it as a teacher, it should have been easy. #12*
>
> *It is not really very easy to use MOLÉ. It could have been easy if there is a user manual. That's my issue. Without an accompanying manual it took a while for me to be able to get used to how the tools can be used. #19*

Participants were concerned about preparing the learning resources for online delivery. They recognized that pedagogy is of prime importance for an online classroom because they needed to apply a different strategy for teaching and learning online. Some were concerned about how to use other resources available on the Internet, not just their lecture notes. Some

were concerned about how they would interact with their students and use discussion forums. Others, who were technically capable, were vocal about their lack of skills in pedagogy for online classrooms. These are some of the participants' comments:

> *Personally, how can I conduct online discussions? I just do one-on-one consultation. But with simultaneous, like chat, I haven't used it yet. I am challenged with how I can use that feature. #14*

> *I still need a training on how an online course should be done, using Moodle, specifically. Because what I only do in my classes, I just upload the resources, and just set-up quizzes there, but I really don't use WebQuest, and other online techniques. #5*

> *The only thing that I have difficulty with is the pedagogy part wherein I have to create the lessons, the lecture materials, and the quizzes and exams for online delivery. #3*

Academics were concerned that students lacked the skills to use the system. Participants complained that time were used for familiarization with the system instead of giving more time to their actual lessons. This problem was common to both undergraduate and graduate students. Participants handling both graduate and undergraduate students said that most of their graduate students were not confident enough to use technology. This research shows that training students was of primary importance to most participants.

> *I was a bit dismayed that not many are familiar with using computers. I thought that the students have already the basic knowledge on computers and that, my concentration would be on the activities that we will have for the class. But then, it seemed that I have to teach the students the basics of computer usage before anything else. #23*

> *Not all students are competent to use especially freshmen students who come from different places. Not all are familiar with technology. So, we have difficulty on implementing and instructing them; unless they received initial training. #16*

> *Some students are panicky. Some graduatestudents are not confident, and they do not persevere. For undergrad students, it is a different thing. Undergraduate students ask how, or the procedures in getting into their account – they really will try, and they ask among themselves. #12*

> *My graduate students are very aloof in using computers – because they are the old-school generation. They have phobia of touching computer. Using computers for online learning is new to them. #1*

> *I think our students in general have not yet attained a certain level of maturity in the use of technology. #2*

That training must not be confined to academics only, was suggested by most academics who already had the experience. They stipulated that undergraduate students must be given training in computer fundamentals in their courses. Graduate students need to attend workshops, as well as receive orientation from administrators to give them an idea of what the system is all about. This implies that a policy for training different sectors in computer use in general, and specifically in MOLÉ use, is necessary.

More importantly, this study has shown that academics need to be trained in MOLÉ usage and pedagogy for online learning. Acquiring the skills can be attained through training. However, the number of academics whose needs are supposed to be given priority should be assessed by the administrators–perhaps on the departmental level.

Academics need to ensure that their skills are adequate enough to impart knowledge to the class in all modes (that is, traditional, blended, or purely online) of teaching and learning environments. They need instructional and pedagogical skills to develop and prepare the learning resources. With technological innovations, the learning landscape has changed and for many, this is a challenge. This has elicited different reactions from academics. Some were enthusiastic and welcomed the developments, while others felt insecure. A proposed solution to the lack of skills is assessing training needs and providing skills development. The comprehensive assessment of training needs is essential to designing training modules. This leads to the discussion of training design constraints.

4.4.2 **Training design**

The design of training is another dimension in training constraints. This dimension refers to themes that relate to the issues of past training attended by some participants, as well as the challenges for designing training. Seventeen participants shared different views about design issues.

Design for training must include who needs to be trained. It is essential that training design has to include plans for the sector of users to be served according to their specific needs. For example, academics who were already familiar with the basics may need further training on how to handle interaction and facilitation. Likewise, the essential components of the learning environment should be included, as well as how the training should be conducted.

There were also some suggestions that participants shared for designing training. For example, a participant suggested that not everyone would have the same level of training. To

familiarize everyone with the system, he suggested an appreciation session could be designed.

> *For the new ones, make it simpler. Just introduce the capabilities of the system, and along the way, let them do it. On training, just introduce the simplest. Let them discover the more intricate and complicated ones along the way. Start small… For advanced users, it can progress to a different level. That means, develop a training to have it by level. #8*

More importantly, an administrator said, focused training would be more practical. Training should be designed for academics, students, and administrators, at different levels of expertise. However, the challenge to the university is recognized in the context of economic capability and the readiness of the university to embark on full implementation of MOLÉ usage. For example, a recent training designed by the MICEL training team was conducted. Training such as this cannot accommodate a big number of academics for in-depth training, because of the availability of hardware resources for training.

> *The training we have is mostly on pedagogy classes. An example would be: how to do a resource-based learning, and MOLÉ basics. #4*

> *The challenge is how to ensure that the facilities are there, how to ensure that the correct attitudes are molded, how to ensure that the appropriate training is undertaken for particular sets of faculty, and particular funds. #18*

When training is designed for a specific purpose and specific sectors it becomes more useful to targeted individuals, so that the training resources, funds, and effort exerted to prepare and actualize the training are not wasted. In this context, training designers need to refer to an updated training needs assessment portfolio.

4.4.3 **Training policies**

Training policy constraints are issues that are particular to what is currently being implemented or followed in the university, as far as training is concerned. Twenty-one participants commented on these constraints.

Previous training for academics was handled and scheduled by a minimal number of academics recognized as part of MICEL. At this stage, more specific implementing policies and guidelines have not yet been realized.

Training is really important. During the training and workshop output must be required of the trainees. Hopefully, the training will enable them to make at least one or two lessons. #12

Require all teachers to be taught to attend an intensive training on teaching online, if they do not know about computer, they have to undergo training on basic computer usage, then progress to the different levels of the training based on their actual needs. # 22

Asserting the need to establish a policy for training is important. That some issues have to be pondered upon, according to one academic, reflects management support of this endeavour.

So, I guess regulations like policies could go a long way in that regard. But you go back to the individual attitude of the faculty, [perhaps] which should be geared toward teaching online. How do you ensure that they have the attitude necessary for the use of TOL at the same time that you exercise responsibility? I thought that training of faculty could be one answer. #18

Just recently they have this kind of training the TOL3 but you have to pay P4000, I think more or less. So that was very expensive, so only one faculty from our department was able to attend that training. #15

The study indicates that many academics wanted to be trained, but the problem that most participants mentioned was about who were allowed to attend training. The policy that exists regarding training fees presents a problem for many academics, who assert that learning MOLÉ should be part of the teaching and learning development program.

4.4.4 **Training services**

Services constraints refer to issues related to the tasks of maintainance and upkeep of computer facilities and information systems, including MOLÉ. The maintenance tasks are handled by the technical personnel of the computer center. Academics consider that assistance from these personnel is very important to their use of MOLÉ. The personnel of the technical support services section assist university-wide end-users upon request. Eleven participants expressed their issues related to technical support, such as the need for an IT helpdesk; account activation problems; and MOLÉ enhancement.

Participants expressed their concerns regarding the need for an IT helpdesk because of cases whereby students and academics experienced technical problems which required the assistance of technical staff. Issues regarding quality assurance, technical staff attitude, and just-in-time assistance were other problems that most participants raised.

> *We have an issue about quality assurance. We need a very reliable helpdesk – a technical helpdesk, such that when somebody calls – like that in MOLÉ, when students have a problem on access, where do they run to? They do not have an outright assistance who to call, or send email to. #17*
>
> *We had also some problems with staff before – computer center staff, and well, the staffs that we had problems before are still there. But we just hope that they change already attitudes towards us. #07*
>
> *You need to orient the teacher, and the students. Also, the infrastructure, and the hardware add to the problem. So when students cannot figure out the problem, they would think they are the problem, themselves. So, students get discouraged and unmotivated especially if the technical support is not available. #12*

On issues related to activation of their MOLÉ accounts, participants were vocal about the requirement of making the request when they wanted to use MOLÉ for a specific course. Their contention was to just have a single request and approval to hold classes using MOLÉ. Current policy requires them to file a request and seek approval to use MOLÉ for each course they handled every semester. This is an issue to participants because they have to personally go to the computer center and talk to the staff regarding their request, because email requests were not acceptable for this matter. While it takes a few minutes (about 30 minutes) to create an account, according to some participants, only the system administrator can accommodate and approve this request. MOLÉ activation is not the only task of the system administrator, though. Some participants recognized that an additional technical staffer is necessary for this function. Likewise, some participants suggested that the university needs a '24-hour helpdesk'. However, they are concerned that it may be difficult for the computer center administration, given the constraints in hiring additional personnel.

> *The only problem is, when you have a new course you still need to request the system administrator to create an account. #32*
>
> *I don't know if that's possible, but they may add 1 additional person, because, now, it is just the web administrator that's been handling these concerns, and I know that web administrators do have other tasks which they cannot focus on attending to the needs of the clients. #6*

While most of the suggestions of the participants were sound, the computer center administrators could have instituted the rules for activation as such, because there could be related procedures for system security, maintenance, and operations. The administrators are in the best position to explain why.

Some participants had issues about aesthetics, because they were keen on the appearance of the MOLÉ's interface as a way of enticing more students to use the system.

> *[M]ake it more appealing, like integrating some services with Google, or Facebook, that could be a plus because there's a tendency that most students use Facebook and less on MOLÉ. They just use MOLÉ because they have exams, or resources to read. #6*

Participants recognized that the computer center has competent staff, however, the number of support staff is lacking. To cater to academics and students using MOLÉ is an added task for the current staff. What some participants envisioned was to have a dedicated staff member who can cater to their specific needs with MOLÉ.

4.4.5 **Summary for training constraints concept**

The four dimensions of training constraints have inter-related issues. The study shows that these are issues because academics and students cannot use MOLÉ efficiently. Moreover, if academics and students are not properly oriented about the system and what they can benefit from using it, usage will be minimal, because the current mode of use is voluntary. It is presumed in this research that if the executive management of the university considers training seriously, usage of MOLÉ may improve.

4.5 Institutional level constraints

Institutional level constraints relate to the actions expected from the executive management of the university. These are constraints that the research indicates as lack of management support, based on the responses of 32 academics, with a total of 318 references. Participants believed that this lack of support has also hampered their use of MOLÉ. Table 4-8 shows two dimensions.

Participants hoped that the executive management would recognize the importance of MOLÉ as a complement to the delivery of instruction. They look forward to the approval of implementation guidelines and policies, and that funding support for training the different sectors of the university be considered.

Table 4-8: Dimensions of the institutional level constraints concept

INSTITUTIONAL LEVEL CONSTRAINTS	Sources (33)	References 318
University policies	29	130
Network infrastructure & computer facilities	32	188

4.5.1 **University policies**

The issues relating to university policies dimension are current guidelines and procedures that exist for the usage of MOLÉ by the university constituents.

There were 29 participants whose comments referred to institutional policies. They believed that the use of MOLÉ will be more appreciated if policies and implementing guidelines for teaching online (whether fully online or blended) are approved.

The most common issues related to regulating MOLÉ use – so that academics would not use it only for their personal advantage or their whims. Also, copyright is an issue, although this can be easily solved because there are prevailing national laws, according to one of the participants. There were also issues related to preparation time and incentive. Participants who consistently used MOLÉ affirmed that using a blended mode was more demanding in terms of preparation and delivery of lessons, hence they looked forward to the inclusion of implementation guidelines for incentives and remuneration.

> *We haven't really had these policies approved so that they can be implemented regarding regulation of online teaching because it is prone to abuse. #18*

> *We hope that the policy and guideline be approved soon. In the guideline, we hope that a form of incentive on how to remunerate the faculty using the MOLÉ is included because when we use the MOLÉ we can increase our enrolment and with MOLÉ it can help solve our classroom problem. We can also attract international students. #14*

However, it was not only remuneration and incentives that some academics were concerned with. Their concern was in their online classroom presence versus their presence in the physical classroom. According to an administrator, the foreseen issue would be how academics' online teaching is credited as a teaching contact? This is a more critical issue pertaining to government bureaucracy, which defines the presence of an academic as the contact with students, that is, actual physical conduct of classes, preparation of lessons, and consultation with the students.

> *So, if there is a time that I use hybrid and then I happened not to have the classroom session, but because I know I can substitute that one and a half hour with an online session, how can that be documented and be treated as a contact hour? #17*

It was suggested that the executive management needs to ponder issues on distinguishing participation of academics who teach online, because preparation for an online classroom involves more activities to have courseware internet-ready, compared to typical classroom preparation. If the bottom-line is motivating academics to do this, then perhaps an extrinsic reward should be given. The university needs campus-like policies for online and blended learning that encompass participation of academics, compensation for the level of effort, and a structure of fees. But crucial to implementing and approving policies for online learning are convincing the university's executive management that instituting this mode of instruction is possible. Furthermore, the support from the executive management to recognize that online or blended learning can be done is highly important. As shared by an academic (with administrative function), it is acknowledged that the challenge to convince the university administrators is steep, especially on the issue about honesty in the classroom.

> *[I]n fact, related to the challenge is basically convincing the system administration of MSU that online can be done and can be implemented. …Because their fear - there is that mindset that, at least cultural in some campuses – that honesty is not yet the best policy, and if that's the mindset then it is really difficult to accept online because there is no physical presence. #17*

Although the mandate and approving policies is the university management's responsibility, academics also need to have their share of responsibilities to make things happen. As it seemed, the possibilities are plenty and the opportunities are vast, when this university can have the policies already in effect.

4.5.2 **Network infrastructure and computer facilities**

Network infrastructure and computer facilities dimension are constraints related to computer and Internet access, computer laboratory problems, and slow connectivity. Issues on computer and Internet access in this context refer to non-availability of access to the network infrastructure, while slow connectivity refers to problems in bandwidth affecting speed. Computer laboratory problems are twofold: unavailability and upgrading.

The majority of participants' reactions points at problems in connectivity. There are some whose problems were concentrated on their own experience, stating that they could not access the Internet from their offices because of slow connections, configuration or set-up problems, or power interruption.

> *[I]n our office from 8 to 5 we have no Internet connection there, and then our Internet connection is attached to the other office, so after 5 we cannot anymore connect to the Internet because they are already off in the other office. #33*

> *It's only at instances when my activities are ready, then suddenly the connection is cut-off; or suddenly there is power failure – these ones, I get discouraged. But these are minor issues. But when they do occur, it is not that long enough to wait to normalize; and it does not matter to me that much. #26*

> *The biggest challenge is on connectivity, especially that we need to pay to have the Internet connection at home and we need to personally really spend. It is not really cheap to have connection and the school is not that accessible even if you have your own laptop. You can't really get [a good connection]. So now, I have to go to some places where there's wi-fi and I need to use my laptop. #25*

Connectivity issues could be of concern to individuals however, it is more of a problem if a whole class were experiencing this problem in computer laboratory facilities.

Most participants were not comfortable conducting examinations or giving quizzes online; hence, they would need a computer laboratory that could accommodate a whole class (normally about 35 to 40 students).

> *So the management needs to provide laboratory for these purposes only. We cannot just schedule our exam during our class schedule. My option is to use a vacant time at MICEL but sometimes we cannot capture all the students in a class. So that's the problem now, with the probability of leaking tests/exams. #17*

Computer facilities are an issue to participants whose courses have no laboratory component, as discussed in section 4.3.2 (learning environment constraints – the curriculum level). It is not possible for all courses in the university to have a computer laboratory component. Thus, to accommodate one class in a laboratory setting, the proposed solution is to establish such a facility for that specific purpose – to provide 'open laboratories' available for scheduled tests for courses without computer laboratory components.

Participants were vocal about becoming discouraged, unmotivated, exhausted, disappointed, frustrated, and their spirits being dampened because of slow connections. These are the same complaints frequently heard from students as well.

You cannot raise the bar higher if we cannot solve the access problem - meaning speed, anytime. … and the hardware add to the problem. So when students cannot figure out the problem, they would think they are the problem themselves. So, students get discouraged, and unmotivated. #12

[I]t is so difficult to access even the e-books that we have because supposedly we can access these. But the problem is it's very slow. #19

A big issue is when we have very slow Internet connections. There are times when our ISP gives us poor service from their dealers – something wrong with the system. #5

4.5.3 **Summary for institutional level constraints concept**

Overall, the issues come from all sectors--students, academics, and administrators. The issues on network infrastructure and computer facilities showed the most number of references in this study, suggesting massive implications.

The institutional level constraints are external barriers or hindrances to academics. These influences affect the use of MOLÉ and cannot be controlled by academics.

4.6 Outcomes

Outcomes represent the effects on the academic as a result of using the learning management system. This section on outcomes summarizes the effects on system use of the drivers and constraints discussed above.

Two dimensions are described: personal satisfaction and system use. Results are shown on Table 4-9 which indicates that all the partcipants gave their views.

Table 4-9: Dimensions of the outcomes concept

OUTCOMES	Sources (33)	References 411
Personal Satisfaction	33	133
System Use	33	288

Most of the coded references that are directed to outcomes were already described in the different dimensions in each concept. Hence, a summary is presented on Table 4-10.

4.6.1 **Personal satisfaction**

The participants' personal satisfaction is the general impression of how academics view of their use of the LMS. Results indicate that it is the level of satisfaction which varies from each individual. Most academics who felt benefitted by LMS use are happy with the system's affordability. The affective dimension of the human-computer interaction has varied levels of positive disposition from among academics though, because of the issues and challenges that each individual has experienced. Environmental constraints (i.e., learning environment, training, and institutional level constraints) affect the behavior of academics towards the LMS.

There are coded references from some of the dimensions that relate to personal satisfaction. From the drivers' concept, teaching performance (referenced in section 4.2.4) and forefront of innovation (referenced in section 4.2.5) have positive effects on personal satisfaction. Academics feel happy about being updated with technologies and get the benefits from LMS usage. More importantly, the improvisation and teaching strategies for some academics contribute to the positive level of personal satisfaction. However, findings suggest that personal satisfaction is affected by some issues related to training need. This study has shown that many academics do not use MOLÉ because of lack of training. Moreover, academics who belong to a college that is not technologically oriented need proper orientation. Also, it is viewed that the younger generation of academics may be more enthusiastic with technology, and could be more interested in MOLÉ; however this is contrary to what a young participant expressed:

> *One of the challenges for using MOLÉ is largely on educating faculty members to be able to get the benefits from the system. Although most of the faculty members in our college are young, they don't really use much of MOLÉ, because maybe they were not trained and they don't have this idea of exploring other avenue of delivering courses. #6*

Because of their lack of skills on some aspects of LMS usage, their satisfaction level is affected. The coded references were stated in section 4.4.1.

Findings also suggest that personal satisfaction drives most academics to use MOLÉ. This indicates that depending how happy or affected they are with their interaction with the LMS, system usage is adhered to.

4.6.2 **System usage**

System usage is the most crucial dimension in this study. In general, results show that the decision for academics to use MOLÉ is dependent on their attitude towards the system, given their current situation. Findings indicate that academics' system usage is constrained by the factors within the learning environment (i.e personal: time; and external: curriculum and students), training constraints, and institutional level constraints. Furthermore, results indicate that the decision to use the information system is discretionary on the part of the academic. To utilize MOLÉ depends on their personal disposal and judgment, which is commonly described by participants as the 'teacher factor'. Anything that happens in the classroom is done under the guidance of the teacher. Results indicate that there are three classifications of usage identified: (1) regular usage, (2) supplemented usage; and (3) usage of other systems. These usage classifications are discussed below.

Regular usage pattern is considered when academics have been using MOLÉ consistently, as well as at what point they started using the system in their classes. An academic who is a regular user could have undergone training or not, and have computer logs recorded in the database server of MOLÉ. This classification is indicated from academics who do not use other systems. There were 16 academics who were categorized as regular users, although their uses were varied. There were those who regularly used MOLÉ, although they indicated that they just use the the system for the purpose of conducting exams only. Also, there were those who used it as a learning materials' repository.

Some academics had decided to supplement MOLÉ use with other systems. There were six participants who supplemented MOLÉ with other systems and surmised that other systems serve their specific purposes well enough. These academics assert that other systems (such as Facebook, Wikispace, etc.) are more appealing to students. However, most of these academics who supplemented MOLÉ with another system recognized that MOLÉ is a very powerful system that can cater to their needs. It is a mutual understanding between them and their students to decide what to use as a supplement. Whatever supplement to MOLÉ academics utilize, they have common aspirations: that the university's management has to upgrade its infrastructure to improve the delivery of blended classrooms.

Using other systems means that academics do not use MOLÉ for their classes. There were eleven academics who were using other systems. It was their choice not to use MOLÉ. Like the previous classifications, they had their own reasons, such as not having time to learn

MOLÉ, or that it was easier to work with social networking sites like Facebook because their students were more attracted to such sites rather than MOLÉ.

To supplement or verify the claims of the participants in this study, computer logs were collected. More specifically, there were 22 out of the 33 participants whose computer logs were available. This indicated that participants used MOLÉ for the period covered in this study. The next section discusses MOLE log entries.

4.7 MOLÉ log entries

This section presents the findings from computer logs that were collected from MOLÉ's database server for the school year 2011-2012 i.e., from the first semester (June to October, 2011) and the second semester (November to December, 2011 and January to March, 2012).

MOLÉ uses a facility of Moodle that can report transactional data within the system in the form of computer logs. Computer log data are represented as either summarized visual graphs, or in database form detailing the records of the activities and the time that user transactions occurred. With computer logs, different stakeholders can be informed of the various aspects of system usage. For example, the database and network system administrators have specific tasks in the management and control of the system which allows them to refer to computer logs relating to the traffic volume or problems with the network.

Academics can look at the computer logs for different purposes such as who, when, and what activities that their students performed, including viewing or reading course materials, submitting assignments, participating in forums, or other activities that are possible in the system. Such information about activities and actions can be derived from computer logs and is used in this research to verify the different dimensions of the participants' interaction with the system.

Based on the three classifications of system usage that were discussed in section 4.6.2, only the log data of 16 regular MOLÉ users and 6 supplementers were included in the computer log findings. The following sub-sections discuss the details of these items, describing the activities recorded, and showing the table of comparison for most of the demographic data (i.e., academic attributes) that were discussed in section 4.1.

4.7.1 **MOLÉ log terminologies**

This section presents the components of MOLÉ with which the users interact. The terminologies used are described to aid in understanding the logs that are shown in each of the tables.

Users of MOLÉ start their interaction with their course by logging in to its main page. Once logged in, the database server records every instance of the interaction. Records of transactions are made for activities in the online classroom such as:

- When teachers add lessons or learning materials to their courses as well as when lessons are updated and edited
- When teachers or students participate in discussions and contribute in forums in asynchronous mode
- When teachers or students participate in real-time discussions – which are recorded as chats
- When teachers require students to upload their assignments
- When teachers design and set up quizzes; these can be automatically graded and feedback can be given, or the correct answer shown
- When a teacher or students edit and add to a wiki, journal, blog, and survey facilities
- When the resource facility is used to put links to other learning materials such as pdf files, spreadsheets, databases, URLs, books, and video materials, among others

Along with these activities are the actions that can be done for each of them including add, delete, edit, and upload. The following main elements of the computer log files are described as follows:

- *Course* is the main unit in the learning system with the topics displayed in the interface. Users can either upload learning materials or write on the interface. Learning materials can be in PDF, spreadsheet, or word processed formats. When materials are uploaded in the course page MOLÉ becomes a repository for the storage of these materials.

- *Quizzes* can be constructed in the system in conjunction with its database. Only the administrator and teacher's roles have editing rights to the quizzes. Once deployed and activated, students can answer the quizzes.
- With *assignments* and other materials students are provided the facility to upload for submission.
- *Forum* is the communication interface where users can post announcements, messages, news, or topics for discussion in asynchronous mode.
- *Chat* is the real-time synchronous communication facility where all the participants in the specific course can participate.
- Other activities include *journal, blog, survey,* and *wiki*.

The subsequent sections will use the above terminologies in presenting the data from MOLÉ logs.

4.7.2 **MOLÉ log activities**

This section discusses the transactional log data/records that were derived from the MOLÉ database. There were 42,839 records that were retained for the analysis of log data after the filtering process that was described in section 3.2.3. Demographics of MOLÉ logs are discussed in this sub-section using the terminologies above. Table 4-10 shows the activities that were recorded for each of the 22 academics.

The left-most column represents the academics (as Acad. Num). Ten of the academics from the total number of 33 participants were not users of MOLÉ, hence they were not included in this table or the subsequent tables in this section. Also, one of the 23 academics who said in the interview that she was using MOLÉ in her classes had no dataset available. This academic had been using the system much earlier, but due to assignment to a high-ranking position in the university, no records of her activity were stored, which meant she had not utilized the system for a specific period. Consequently, only the usages of 22 academics were included for MOLÉ log usage analysis.

Table 4-10: Main activities for Academic Year 2011-2012

Acad. Num	Non-interactive				Total Non-interactive	Interactive					Total Interactive	Grand Total
	course	assign-ment	re-source	survey		quiz	forum	blog	chat	journal		
	(22)	(17)	(18)	(2)		(13)	(18)	(6)	(1)	(4)		
# 26	2,970	2,935	335		6240	519	1,799			1,306	3,624	9,864
# 5	4,770	2,939	644		8,353	1,124	25	1			1,150	9,503
# 15	1,008	978	228		2,214	850	893		4	26	1,773	3,987
# 9	1,265	1,874	211	31	3,381		198	2		160	360	3,741
# 13	257	3,365	3		3,625		110				110	3,735
# 28	629				629	1,521	134				1,655	2,284
# 25	643	653	80	3	1,379	38	10	5			53	1,432
# 6	475		411		886	373					373	1,259
# 27	628	219	31		878	329	15	2			346	1,224
# 18	435	59	86		580		629				629	1,209
# 4	324	125	72		521	26	225				251	772
# 33	588	37	70		695	11	15				26	721
# 3	400	9	46		455	114	5			20	139	594
# 19	339	17	106		462		70	3			73	535
# 22	208	43	46		297	144	1				145	442
# 17	357	10	21		388	1					1	389
# 32	150	14	36		200	131					131	331
# 20	123	139	14		276							276
# 2	92				92		122	3			125	217
# 14	185	2			187		2				2	189
# 31	80		28		108		3				3	111
# 23	14				14		10				10	24
Total	15,398	13,406	2,447	34	31,860	5,180	4,264	16	4	1,512	10,979	42,839

A more specific group of activities is presented as non-interactive and interactive as shown in the top-most row of Table 4-10. Non-interactive activities are notions that do not have interchange of ideas among the participants of the learning environment. For example, students are just required to submit an assignment or a requirement for the course. Once uploaded, the teacher can mark the assignments in the system and then post the marks in the assessment section for the students to view the results. Interactive activities allow the exchange of ideas between the teacher and students, or between students, such as what happens in discussion forums. Communication happens in interactive activities. Likewise, an interactive activity occurs when students have to answer the quiz that is deployed and activated by the teacher in a specific period.

Under each column heading of the table is a number in parenthesis which indicates the number of academics who used each element or activity, while the numbers shown in each cell indicate the total usage counts.

The non-interactive group of activities consists of course, assignment, resource, and survey. The course column shows the logs that were recorded when users logged in and pursued some activities within the learning environment. With the exception of course logs, assignment activity is shown to have the highest transaction count (total = 13, 406), although the resource activity is shown to have the most number of academics (18) utilizing it.

The interactive group consists of quiz, forum, blog, chat, and journal activities. Forum is shown as the most often-used activity with 18 academics who used it. Quiz is shown to have the most interactions (total = 5,180), while chat is shown to have the least interactions. Per indication, one academic's record (#28) shows that quiz was utilized the most. Also, chat was not commonly used as shown in the table – with only one academic (#15) recorded to have used it.

4.7.3 **Presenting usage counts and strength**

This section presents the total usage counts and describes the usage strength for each academic. These abstractions of usage counts and strength are presented in Table 4-11 and described in detail in the following sub-sections.

Table 4-11: Usage counts and usage strength

Acad. ID	Num of	Absolute	Relative	Usage strength
# 26	81	9,864	121.78	Extremely high
# 15	52	3,987	76.67	High
# 17	7	389	55.57	High
# 9	70	3,741	53.44	High
# 5	273	9,503	34.81	High
# 3	31	594	19.16	Medium
# 18	67	1,209	18.04	Medium
# 25	107	1,432	13.38	Medium
# 4	72	772	10.72	Medium
# 22	44	442	10.05	Medium
# 14	19	189	9.95	Medium
# 28	257	2,284	8.89	Low
# 27	149	1,224	8.21	Low
# 6	165	1,259	7.63	Low
# 20	39	276	7.08	Low
# 13	785	3,735	4.76	Low
# 33	164	721	4.40	Low
# 2	56	217	3.88	Low
# 19	172	535	3.11	Low
# 31	48	111	2.31	Low
# 32	160	331	2.07	Low
# 23	111	24	0.22	Extremely Low
Average	**133**	**1,947**	**21.64**	
Median			**9.42**	

4.7.3.1 Absolute and relative log entries

The absolute log entries shown in Table 4-11 indicate the total count of each academic's interaction, while the relative log entries show the equivalent of the absolute count divided by the number of students. Thus:

$$\text{Relative log entry} = \frac{\text{Absolute log entry}}{\text{Number of students}}$$

The relative log entry values are important as these provide the comparative values of usage per academic in reference to the number of students in all the courses handled. Using relative log entries for instance, the record of academic number 5 whose interactions presented as an

absolute log entry of 9,503 is one of the highest with 273 students yielding a relative log entry of 34.81. In comparison, academic number 17 has absolute log entry of 389 with 7 students; having a relative log entry of 55.57, which is higher compared to the relative log entry of academic number 5.

4.7.3.2 Describing strength of usage

The essence of looking at the relative log entries is extended to determining the strength of usage. In this research context, strength of usage qualifies the relative log entries into the common terms used as high, medium, or low. However, data shown in Table 4-12 indicate that there is a large variation of these values.

Table 4-12: Usage strength of relative log entries

USAGE STRENGTH	Low end log entries	High end log entries	Range
Extremely High		121.78	
High	34.81	76.67	41.86
Arbitrary: high	19.17	34.80	15.63
Medium	9.95	19.16	9.21
Arbitrary: medium	8.90	9.80	0.9
Low	2.07	8.89	6.82
Arbitrary: Low	0.23	2.06	1.83
Extremely Low	0.22		

These variations of usage counts are more prominently shown in the graph in Figure 4-1 below. It was observed that the top-most user (Acad. num 26) and the least user (Acad. Num 23) both have extreme relative log entries: with 121.78 as extremely high, and 0.22 as extremely low, respectively. These two values were set aside and given its category as extreme values based on the entries. Thus, for log entries that are between 76.67 and 2.07, the strength of usage is assigned as shown in Table 4-12 above.

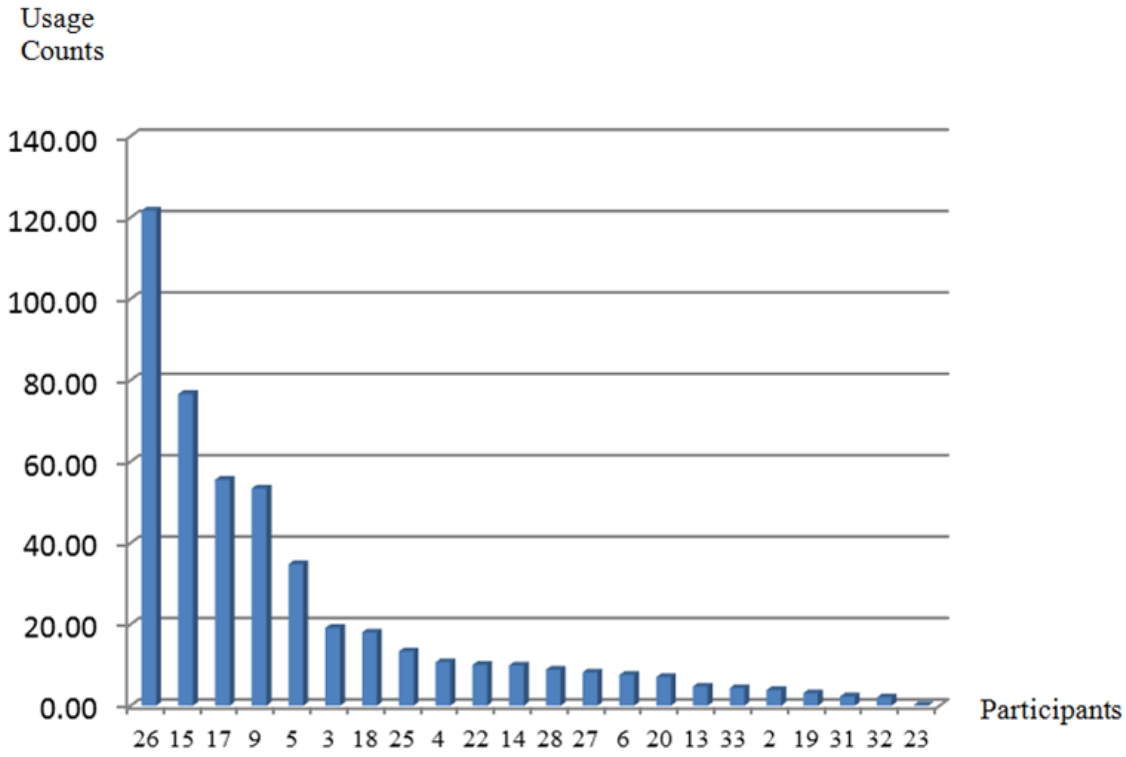


Figure 4-2: Relative log entries (Participants vs usage counts)

High usage strength has values that are between 34.81 and 76.67; medium usage strength has values from 9.95 and 19.16; and low usage strength has values from 2.07 and 8.89. Also, Table 4-12 shows arbitrary values in the range between low-end log entries and high-end log entries. These are considered necessary for labeling and explaining the strength of usage per category in the following sub-sections.

4.7.4 **Categorized logs**

This section describes the strength of each category based on the computed average and median of the relative log entries. These strength qualifications will be discussed in the next chapter using quantitative analysis to further explain the relationships of the components of each category. Table 4-13 shows a summary of the strength in each group within a category. The data recorded in this summary were derived from various tables of comparison in appendices H and I.

Table 4-13: Summary table of comparison per category and strength of usage

CATEGORIES	Participants with Logs	INTERACTIVE				NON-INTERACTIVE				Participants without Logs
		Ave.	Ave. Strength	Median	Median Strength	Ave.	Ave. Strength	Median	Median Strength	
A: Academic Discipline										
Group A_Eng'g, Sc., and Maths	5	1.95	Low	1.23	Low	4.78	Low	2.69	Low	6
Group B_Soc Sc., Arts, & Educ	10	10.04	Medium	3.39	Low	20.74	High	7.95	Low	1
Group C_Bus., Nurs., & Comp. Studies	7	2.03	Low	2.26	Low	17.18	Medium	7.08	Low	4
B: Academic Position										
With administrative load	9	2.59	Low	2.23	Low	13.90	Medium	7.24	Low	3
With No administrative load	13	7.78	Low	2.26	Low	17.42	Medium	5.89	Low	8
C_Gender										
Male	12	5.68	Low	2.25	Low	18.05	Medium	6.48	Low	4
Female	10	5.63	Low	1.86	Low	13.50	Medium	6.99	Low	7
D_Usage Mode										
MOLE only	16	5.49	Low	2.78	Low	18.09	Medium	7.95	Low	Alterna
Supplemented	6	6.12	Low	0.13	Low	10.36	Medium	5.07	Low	tive:11
E_Program Level										
HUD_Both UG & HD	10	2.51	Low	1.33	Low	18.92	Medium	4.24	Low	8
Undergraduates only	12	8.28	Low	2.29	Low	15.12	Medium	7.08	Low	3
F_Training Mode Attended										
Attended training	14	7.50	Low	1.41	Low	20.98	High	9.25	Low	9
Self-trained	8	2.44	Low	2.25	Low	7.23	Low	3.91	Low	2
G_Age Range										
25 to 44 years old	11	8.83	Low	2.32	Low	18.35	Medium	7.24	Low	4
45 to 65 years old	11	2.49	Low	0.42	Low	13.61	Medium	6.75	Low	7
H_Teaching years										
1 to 15 years	11	8.45	Low	2.26	Low	16.22	Medium	7.08	Low	3
16 to 30 years	5	2.68	Low	2.23	Low	9.44	Medium	2.69	Low	4
31 to 45 years	6	3.03	Low	1.72	Low	21.00	High	7.70	Low	4
I_MOLE Sem Experience										
1 to 10 semesters	15	6.98	Low	2.28	Low	19.38	High	7.24	Low	6
11 to 20 semesters	7	2.83	Low	2.26	Low	8.70	Low	5.37	Low	5
J_Interactive										
1_Low	19	1.91	Low	0.82	Low					
2_Medium	1	9.39	Medium	9.39	Medium					11
3_High	2	39.42	High	39.42	High					
K_Non-Interactive										
1_Low	14					4.30		4.43	Low	
2_Medium	3					12.47		12.89	Medium	11
3_High	5					50.79		48.30	High	

The composition of each category is described below:

- Category A comprises the specialization groups which show the three different academic disciplines. Group A comprises all courses in the Engineering, Engineering Technology, Sciences, and Mathematics. Group B comprises all courses in the Arts and Social Sciences, and all courses in Education. Group C is composed of the

Business courses, Computing, Electronics Technology, and Information Systems, as well as Nursing;

- Category B is composed of academic positions which are divided into two groups: the academics with administrative and academics with non-administrative positions;
- Category C shows the gender compositions of the participants;
- Category D presents the usage mode classifications which are: the supplemented use and regular users of MOLÉ use;
- Category E classifies the program level handled by academics which are those who handled solely undergraduate courses, or both undergraduate and higher degree courses;
- Category F is the classification for those who had attended basic to advanced training workshops, and those who trained themselves (self-trained);
- Category G has two age groups: 25 to 44 years old; and 45 to 65 years old;
- Category H is classified for teaching service in years which is comprised of three groups: 1 to 15 years of teaching service; 16 to 30; and 31 to 45 years of service;
- Category I is the group for MOLÉ experiences in semesters grouped into two: 1 to 10 semesters, and 11 to 20 semesters; and
- Category J and K are log data from usages of interactive and non-interactive features of MOLÉ.

Results from Table 4-13 indicates that system usage varies from low-medium-high in almost all categories in median values. Categories B (academic position), C (gender), and G (age range), H (teaching years) and I (MOLE experiences) have small differences in median values, while categories that have slightly bigger difference are shown in categories D (usage mode).

Category E (program level) shows a difference of 0.96 and 2.84 on interactive and non-interactive features. The difference is shown on courses that were dealt with between the undergraduate and higher degree courses. Similarly, a difference of 0.84 on interactive and 5.34 on non-interactive features were shown in category F (training mode attended) between those who had attended training workshops and those who self-trained. Although the

difference is not so big, the difference between non-interactive and interactive features is noticeable.

A big difference is indicated between the groups in category A (academic discipline). In particular, between groups A and B, the difference is 5.26, and between A and C the difference is 5.38. Between Group B and Group C there is a slight difference of 0.87. To recall, Group A are specializations comprising courses in the College of Engineering and College of Science and Mathematics. This group was described in section 4.1 as having a high percentage of analytical, practical, and problem solving courses. Group B specializations are courses that were described as having a high percentage of descriptive courses which are offered in the College of Arts and Social Sciences and College of Education; while Group C lies between groups A and B where courses from Colleges of Business, Computer Studies, and Nursing are offered.

In summary, the relative values are useful data that were used to further analyze and triangulate the relationships in the next chapter.

4.8 Validation of findings

This section discusses the steps that were carried out to ensure the credibility of this study. These steps – validating interview transcripts and presentation of results to participants are described in the subsequent sections.

4.8.1 Validating interview transcripts

To increase validity of the findings in this research, the interview transcripts and a copy of the findings draft were emailed to the participants. Participants were encouraged to express their views or comments by replying to the email that was sent to them. Some of the relevant comments received were as follows:

> *Amazing! I commend the way you organized the details of my interview, despite my disorganized way of giving my answers. However, as I read through everything of my interview transcripts, you have accurately written what I really meant…I'm looking forward to a more exciting online/blended learning environment #23*
>
> *I like the model that you have developed. It encompasses the critical elements that will encourage voluntary usage of LMS by most faculty members. In my case, however, I think the biggest motivator is the desire to be a better teacher with students' learning being maximized if possible. It's here that LMS has been a great "assist" system. It allowed me to implement, though unconsciously, the flipped classroom*

concept where students were given online inputs/activities which made them better participants during the in-class sessions. #17

There were ten participants whose comments were received in relation to the interview transcripts

4.8.2 **Presenting for sub-groups**

The findings in this study were presented to the participants in two instances. Firstly, the results were presented to the participants of this study who had no administrative functions. Thirteen participants attended this first workshop. Secondly, another workshop was conducted with some of the research participants from the executive management level. Some attendees were also invited composed of the deans from all colleges, as well as graduate coordinators from each college. Twenty academics attended this second workshop.

In both workshops the theme focused on the use of LMS in a blended learning environment. Practically, the outcome of the investigation on voluntary system usage was emphasized. The participants were asked to fill-in a form created in Google Form after the question and answer (Q & A) forum – requesting them to write their comments and/or suggestions. Some of the comments were:

There are faculty members in my college who are administering blended learning. They have negative comments in terms of time spent in preparing for this mode of delivery. #7

Would you like to do a comparative study of this present case study with other learning institutions in regard to the usage of LMS? That would really be interesting…We look forward to engaging with you, even in my retirement. #18

The study is very useful since it provides insights on how to improve the system as well as increase the usage of MOLE. It is also very important to evaluate the MOLE trainings conducted – were the ones trained already frequent users of MOLE or if not, why? I think it would not be very good to force teachers to use the MOLE since "heartfelt" decisions on changing the way or how we teach does not happen overnight. Use of an online learning environment is a paradigm shift and a change in paradigm is not an easy process. I think MOLE is a very good tool and faculty of this institute would eventually migrate from edmodo, wikispaces, or whatever platform they are using right now. #30

Consequenly, most of those who participated had a more positive view of blended learning environment aided with MOLE. A question was addressed by an executive administrator to the attendees present during the Q & A forum; he asked them whether they think the blended

learning mode of delivery will really work at MSU-IIT. The attendees responded affirmatively.

4.8.3 **Section summary**

The validation process that this study has made was a rigorous undertaking. It is an essential component of this research such that it has served as a justification of the relevance of investigating the pros and cons of using an LMS in blended or online learning environments. Moreover, by validating the results from academics, better prospects of how a paradigm shift on teaching and learning process may be supported.

4.9 Chapter summary

This chapter described the findings from qualitative interviews and computer logs. The concepts that resulted from the coding processes were derived, which are summarized in Table 4-14 below:

Table 4-14: Summary of concepts and dimensions

Concept	Dimension	Description
Drivers This concept is arrived at from themes that indicate usefulness and acceptability of the LMS. Academics who expressed certain levels of satisfaction relate their experiences in terms of the benefits gained from using the system. They differentiated how activities are not possible in a traditional classroom. Whereas, a hybrid classroom affords them to strategize and improve their teaching and learning environment because of the notion of complementation.	Interaction and communication	One of the three main features of an LMS which allow users to interact and communicate asynchronously or synchronously. This capability encourages academics to use the system to extend contact with students and give assistance beyond their class periods when necessary.
	Feedback and assessments	Another feature of the LMS that makes it easy for academics to give feedback and comments including test results. Scores are displayed right after submission of the tests. This capability motivates academics to use the system as this task ease the burden of checking or marking tests.
	Learning resource management	The third main feature of the LMS which help in organizing and managing learning resources. This facility makes it possible for students and academics to upload and download files anytime, anywhere from the Internet.
	Task performance	Using the 3 main features and other facilities incorporated in the LMS, users are mostly pleased, particularly on the conveniences that the system provides. Strategies on teaching with innovative use of technology make it more appealing to most academics.

Each of the dimensions in this abstraction is described as motivating factors for academics' decision to use the LMS.	Forefront of innovation	The feeling that they are using an innovative and technologically advanced system in the teaching and learning field motivates some academics to use the LMS. The notion that using a 'high tech' and 'in-phase with the trend' system drives others to use the system because they feel that they have technological advantage, and can become more competitive in research and education.
Learning environment constraints This concept is characterized by academics' adherence to academic freedom. The use of the LMS in the learning environment is voluntary. Two main actors in a learning environment are academics and students.	Curriculum	Curriculum constraint includes challenges in two specific areas: non-technology driven (courses that do not require computers such as in the arts and social sciences, and business compared to engineering, technology, and physical sciences) and course description (problem-solving, analytical, and simulation type of courses.
	Time management	Time management is a constraint affecting academics on the time element related to preparation of teaching materials, equating time to compensation, and time wasted due to connectivity problems.
	Students' access and economic viability	Economic viability is the major reason that affects students' accessibility to computers. In effect most academics are constrained to use the LMS.
	Students' work and validity of control	This constraint refers to the element of trust when students' assessment tasks (e.g. during quizzes) are performed outside the classroom.
Training constraints There are four dimensions that characterize this concept. Training constraints are considerably external factors that academics consider as essential to their usage of the LMS.	Training needs	Technical and pedagogical skills upgrade and acquisition are the two main components of training that most academics identified. The lack of training among academics is constraining. The need for training on basic and advanced system usage and development of learning modules include the use and application of the features of the LMS and some software related to producing interactive learning resources. Likewise, acquiring pedagogical skill is necessary to enable academics to efficiently manage classes, especially large ones. Training should not be limited to academics. In a larger scale, students also need usage training to ease the burden of academics on giving training themselves before their own courses are tackled.
	Training design	A focused training design means considering who are going to be trained (whether academics, students, or administrators); and what level of training will be necessary. For example: (1) basic usage level: setting up, navigating, and uploading/downloading files; (2) intermediate level: using communication tools, setting up quizzes; and setting up links; and (3) advanced level: creating modules, and developing multimedia and interactive learning resources. Basic usage level is necessary for everyone, while intermediate and advanced levels are essential for academics. Advanced level may be of interest as well to administrators, but not necessarily so.
	Training policies	Policies related to training include participation and funding requirements, scheduling, and expected training outcomes.
	Training and development services	Training services is a useful component that can assure academics that they and their students can avail of technical assistance anytime (as in IT helpdesk). Another composition of training services is for development of multimedia and

		interactive materials.
Institutional level constraints This concept constitutes the dimensions that are specific to the role of the executive management of the university – prominently addressed by academics as having significant influence on their decision to use the system	University policies	Policies related to the implementation of blended learning which is officially recognized by the executive management of the university. Policies should detail the conduct of classes in the blended modes, compensation scheme, and training of academics and students, among others.
	Network infrastructure and computer facilities	Deals with the necessary technologies that support the blended learning environment, including policies of usage, maintenance, operation, and technical support.
Outcomes This concept constitutes the results in this investigation. Outcomes are best explained in the analysis chapter in this thesis	Personal Satisfaction	Largely depends on the attitude of academics towards the system. Personal satisfaction indicates positive responses that resulted from the dimensions in the drivers' concept. However, with training needs as a constraint for some academics, their satisfaction level has been affected.
	System usage	System usage has three classifications: regular use, supplemented use, and using other systems.

Table 4-14 shows the five concepts and 17 dimensions which were derived from the open coding process. A higher level of analysis is presented in the next chapter which integrates the findings from both qualitative interviews and computer logs.

CHAPTER 5

5 ANALYSIS AND THEORY DEVELOPMENT

This chapter presents the analysis of the concepts derived from the research findings in Chapter 4. It investigates the relationships of the concepts attempting to address the research questions in Chapter 3, and to support the emergent theory in this study. The outcome of this chapter will be compared with the literature in Chapter 6 while part of the conclusion in chapter 7 is based on this chapter.

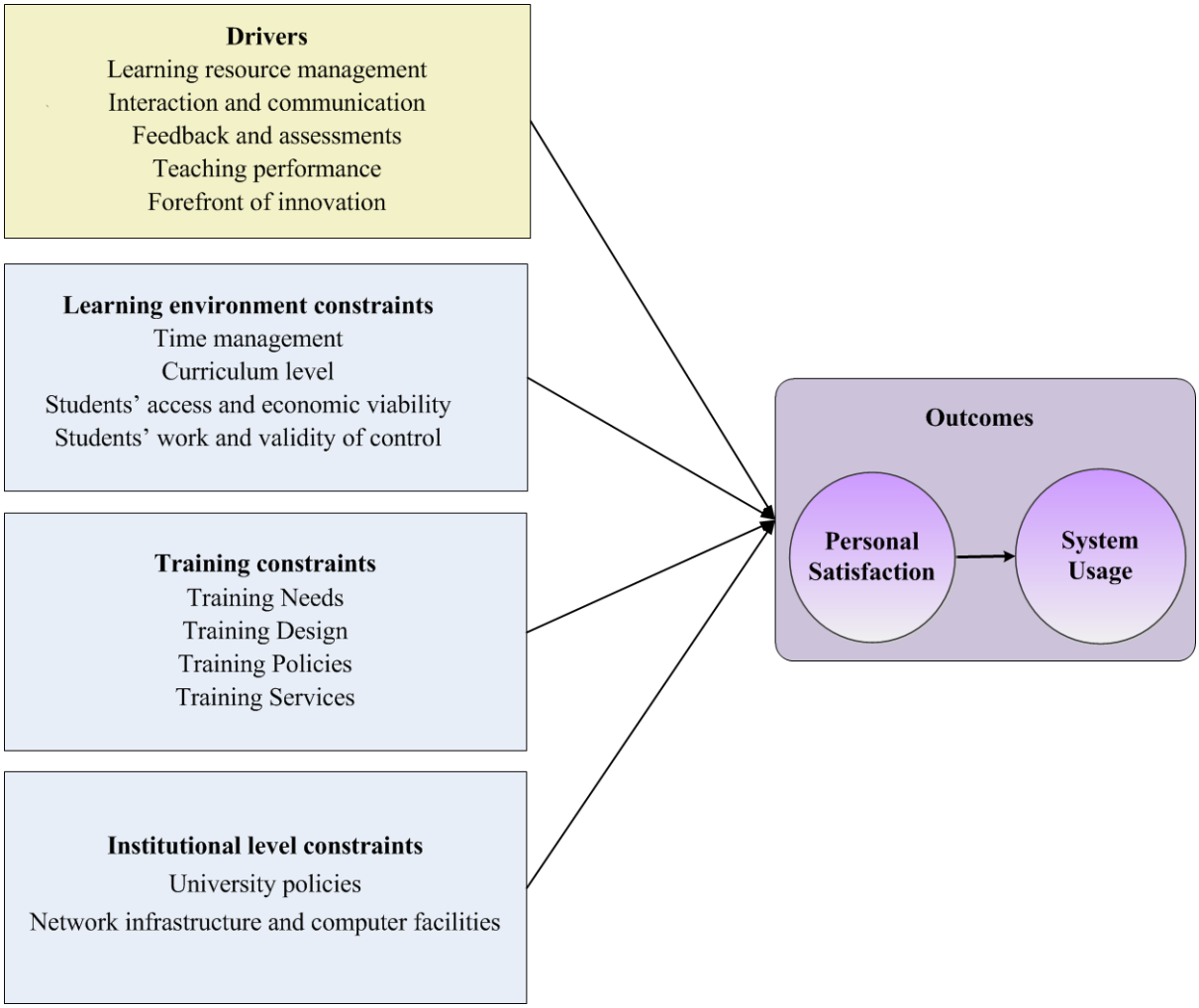


Figure 5-1: Concepts and its dimensions

In Figure 5-1, it is shown that all four concepts – drivers and constraints (learning environment, training, and institutional level) impact outcomes. This notion of impact from drivers and constraints are analyzed using the coded references from interviews and system usage logs.

In analyzing the interview data, the comparison of coded references is based on the matrix as shown in Table 5-1. The two sets of numbers in each of the cells represent the sources and coded references. Coded references are inside the parenthesis. On the other hand, the total number of participants or the sources is indicated in the intersection of each concept such that drivers have 27 sources. It is important to note that drivers refer to motivators for using the system, hence, there are six out of the 33 participants whose comments are not included in this concept because they have been referring to constraints. Training and institutional level constraints have 32 sources. All the 33 participants commented about the learning environment constraints and outcomes.

In subsequent sub-sections, these numbers will be used in interpreting the percentages and relationships of each of the dimensions and concepts based in Chapter 4 and summarized in Figure 5-1.

Table 5-1: Matrix of all the concepts gathered from interviews

	Drivers	Learning Environment Constraints	Training Constraints	Institutional Level Constraints	Outcomes
Drivers	27 (245)	16 (39)	15 (27)	14 (26)	27 (135)
Learning Environment Constraints		33 (285)	27 (81)	28 (115)	32(147)
Training and Development Constraints			32 (182)	24 (91)	31 (105)
Institutional Level Constraints				32 (262)	32 (179)
Outcomes					33 (351)

The strength of the relationships is determined in relation to how many participants contributed to the concepts and how many coded references were made about the concepts. However, the number of sources and coded references are not the only bases. The following considerations were also taken into account:

- The weight of the number of contributions is scrutinized further of its quality of utterances (coded references)
- The coded references made by each participant answered the research question/s
- Contents of the coded references are relevant

As a guide in this interpretation, the strength of the relationships was assigned as follows:

- Strong relationship exist for 17 to 33 sources
- Moderate relationship exist for 9 to 16 sources
- Weak relationship exist for 1 to 8 sources

The percentage of coded references made for each concept as compared to the total number of coded references is shown in Figure 5-2.

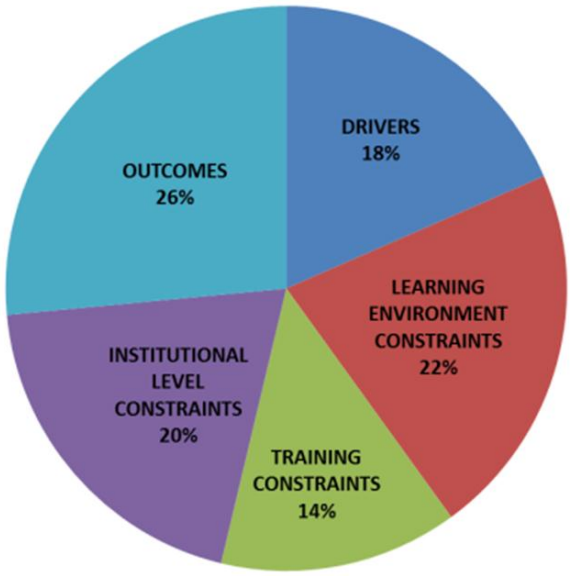


Figure 5-2: Percentage of coded references for each concept

Percentage wise, the outcomes indicate that this concept summarizes both the positive experiences (drivers) and the issues (constraints) on MOLÉ satisfaction and usage at MSU-IIT. The figure shows that the outcomes have the most number of references which is equivalent to 26%. Institutional level constraints have 20%, while drivers have 18% references. The concept on training constraints has the least number of references with 14% of the total references. This does not indicate however that training constraints is the least important.

The key elements of the theory development that have emerged from the interview and log entry data are further analyzed in this chapter. A useful mechanism for comparison of references is to use the participants' attributes in the nine categories which are: academic discipline, academic position, gender, usage mode, program level handled, training mode attended, age range, teaching service years, and MOLÉ semestral experience. More specifically, differences are compared between the groups per category. Table shows the attributes of each of the categories.

Table 5-2: Categories and attributes

CATEGORIES	Attributes
Academic Discipline	GrpA_Eng'g. Sc., & Math.
	GrpB_So.Sc,, Arts, & Ed.
	GrpC_Bus., Nrsng, & C.S
Academic Position	With administrative load
	With No admin load
Gender	Male
	Female
Usage Mode	MOLE only
	MOLE with supplement
	Alternative (others but MOLE)
Program Level	Graduate
	Undergraduate
Training Attended	Attended training
	Self-trained
Age Range	25 to 44 years old
	45 to 65 years old
Teaching years	1 to 15 years
	16 to 30 years
	31 to 45 years
MOLE Semestral Experience	1 to 10 semesters
	11 to 20 semesters

Analyses of coded references of each of the four concepts are presented in three sets:

- Comparing demographic categories of the dimensions for each concept. Comparisons of what participants said about the dimensions are reported in the tables in specific sections. In those tables the intersecting cells are marked by either the letters X or Y. X implies that there are no differences in a specific category in a particular dimension, while Y indicates that there are differences. Differences are determined based on the references – whether the utterances are the same or similar in each of the groups in the categories, or if the utterances deviate or differ from that of the other group/s;
- Comparing system log usage of the dimensions for each concept. Comparisons of references are between low and high usage of interactive and non-interactive features of the system; and
- Establishing inter-relationships of the dimensions. Relationships of the dimensions within each concept were established, which were then related to the outcomes concept (i.e., either linking to personal use, or system usage).

A record of the number of coded references and sources per category on all dimensions are detailed in the matrices shown in Appendix J and K respectively.

5.1 Drivers

The drivers concept is described in Chapter 4 as motivators that influence academics to sustain their usage of MOLÉ. This concept has five dimensions which are grouped into two: (1) task performance of the LMS that include: learning resource management, interaction and communication, and feedback and assessments; (2) references that imply feelings or behaviour towards MOLÉ, which include: teaching performance, and forefront of innovation.

The percentage of coded references for each dimension is shown in Figure 5-3.

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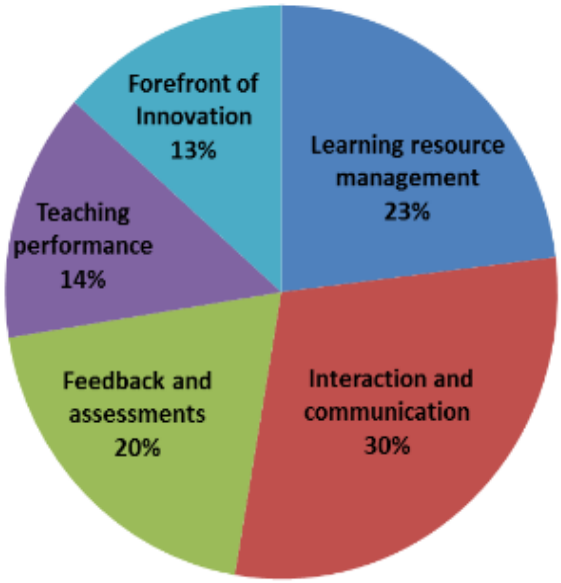

Figure 5-3: Percentages of coded references for driver dimensions

The interaction and communication facility shows the highest percentage (30%) of the total coded references, while learning resource management, and feedback and assessments have 23% and 20% respectively. Teaching performance has 14% and forefront of innovation has 13% coded references.

5.1.1 Comparing demographic categories with driver dimensions

As shown in 5-3, the study shows that using the tools for learning resource management (LRM), interaction and communication (I&C), and feedback and assessments (F&A) have differences in four categories: academic discipline, academic position, program level handled, and training mode attended. Each of the subsequent section discusses the details of the coded references.

Table 5-3: Differences between attributes within categories for each driver dimensions

CATEGORIES \ DIMENSIONS	Learning Resource Management	Interaction and Communication	Feedback and Assessment	Teaching Performance	Fore-front of Innovation
Academic Discipline	**Y**	**Y**	**Y**	X	X
Academic Position	**Y**	X	X	X	X
Gender	X	X	X	X	X
Usage Mode	X	X	X	X	X
Program Level handled	X	X	**Y**	X	X
Training Mode Attended	X	**Y**	X	X	X
Age Range	X	X	X	X	X
Teaching years	X	X	X	X	X
MOLÉ Semester Experience	X	X	X	X	X

5.1.1.1 Academic discipline influences the perception of LRM tools

Participants from Group A were more vocal about their views that MOLÉ was more useful in descriptive subjects because, there was a need to discuss explicitly to their students the important concepts to solve problem-based activities. Participants 8 and 33 opined:

> *A chalkboard is needed right there so I can discuss and illustrate how to deal with solving computational problems. So I do not find it useful for my subject. I can see that perhaps for descriptive subjects, it is okay. But I can't see it for calculations. #8*

> *I have uploaded some of my lectures in MOLÉ. I think MOLÉ is more okay for descriptive type of courses, but in problem solving it is difficult. #33*

Similarly, participants from Group C whose subject content have mixed topics said that oftentimes their use of MOLÉ was largely for the repository of their lessons, programming assignments, and cases. Discussions of the topics were conducted face to face. To illustrate:

What I do is to announce in class that the reading and cases are available online…Since they have already read the materials, so, outright, when I meet them in class, there is no more repetition of whatever is there. #17

I just upload the resources, and just set-up quizzes there, but I really don't use WebQuest, and other online techniques…MOLÉ only serves as a repository of my lecture notes. #5

Participants from Group B were appreciative of the tools of MOLÉ as a learning resource manager because materials were readily available and related topics can be found using the links. Also, materials already uploaded in MOLÉ can be improved and can be re-used.

Now, my practice is, in the classroom when we meet eyeball to eyeball, this is collation now. Because all readings – all studies will be done outside. So you can imagine the percentage of learning, and the knowledge generation that has this set-up. # 31

It is very convenient because instead of letting them go to the library to read so many books for our subject, they can open the computers and search or surf the Net. They can look for the topics because I provided them the links in MOLÉ. #13

Another thing that I do is to upgrade and re-use my previously held subjects. With re-using the already made materials I can improve whatever I may have lacked. #26

Participants had positive views about MOLÉ as a learning resource manager as stated above. There is also a need to look at other references where participants' decision to use MOLÉ is affected. For example, it appeared that it was not the academic discipline that matters. The data shows that it was the subject content that made it difficult for the participants to use MOLÉ for their needs.

Sad to say because of the subject matter itself … so my graduate students are thinking that the subject is really very technical. #1

I use it for four of my major classes.They are problem-based. We need to calculate for given problems….I don't really use the interface. I use MOLÉ like a host to the materials that I have. #25

Since it is the history of Math, it is descriptive. And because it has so many resources, I find it very useful to use MOLÉ. I don't know yet if it is on Algebra. #9

Participants from different disciplines had no common outlook of MOLÉ as a learning resource manager. For participants who were keen on using MOLÉ as a learning resource manager, they used it whenever they wanted it, such as using the system as repository. The major reason found was because, some subject contents had different discourses and cannot be appropriately delivered online.

5.1.1.2 Academic discipline influences the perception of I&C tools

Overall, participants from Group B had been utilizing the interaction and communication feature more than what Group A and Group C did. Group B participants found discussion forums as an effective tool to exchange opinions, reach out to others, collaborate, and interact in classes. Also, they used other I&C tools such as blogs, wikis, and journals as teaching strategies because they believed that students became more open, participative and unintimidated; thus students learned throughout the process. For instance, some of the Group B participants shared that:

[W]hen students have their class demonstration I make a forum where they can react to the performance of their classmates so that they can give their feedback, whether positive or negative. Also, they can collaborate in projects and discuss their comments and reactions. #15

I think that they are able to learn, because, for example in the discussion forum they are able to exchange opinions online which may not have been possible if it were a traditional classroom situation. #18

I often use Forum where I post one or two questions so that students can give their ideas or opinions, or anything that will come out from their minds and can be read by their classmates. I also use journals. In the journals other students cannot read the posts of their classmates. I use this when there are sensitive issues that only I, the instructor, can read. #26

While I&C tools were used as a teaching strategy by most academics from Group B, one academic from Group C used Wikis in a computing course. However, the course was not about programming – it was a descriptive subject.

I require my students to submit an essay in wiki. Other students can edit, can add topics and discussions on certain essay. So there is actually interactivity there. #3

The study shows that Group B participants were more interactive and consistent in the use of interactive and communication tools. This group used I&C tools not only to post announcements but also to encourage their students to participate and share their knowledge among their classmates.

5.1.1.3 Academic discipline influences the perception of F&A tools

Group C participants used F&A tools more frequently compared to participants from Groups A and B. Participants from Group C found this feature as useful to keep track of the performance of their students. Courses of group C participants commonly had a computer laboratory component and they can conduct exams online anytime.

From time to time I do short quizzes there. And if it's going to be a class with a laboratory component, I really conduct my major exams online. Because I see them in the lab, and I can roam around the laboratory and see if they're cheating, or what. #5

Most primarily I use MOLÉ for the exams. I still have the face to face class. I am somewhat an 'old school' when it comes to classes. #6

I find it a very useful tool for my students' assessments which is a very useful guide for them, so that they know where they can improve, given the way I'm giving grades, on their submission. #17

The reasons of participants from groups A and B were varied. For example, a participant from Group A was more concerned about his large class and found it useful to conduct exams in MOLÉ. On the other hand, Group B participants whose subjects had laboratory component used the F&A tools to evaluate student performance.

I was interested in using the MOLÉ because most of my classes are large classes, so each class is composed of 50 students and I am handling 3 sections so that is 150 students. I want to administer the exam at the same time to my students to increase the reliability and the validity of the test results. #28

I let my students interact with their classmates so that they can learn from each other. They posted their comments and feedback for the topic discussed, and I would have some kind of grades from the posting of their classmates. # 22

Also, participants from group B were eager to use the new version of MOLÉ because the system was capable of using control mechanisms, such as providing feedback in some quizzes where answers were necessary for students to be able to proceed to the next item.

Except for convenience as a common reason, participants from different disciplines had varied reasons of being motivated to use MOLÉ's F&A tools. Some of them used it for their own advantage. However, the study shows that even though they can conveniently use this tool, it was difficult for many to maximize its use because of the various constraints related to facilities, policies, and their students' capabilities. Constraints are discussed in the latter sections of this chapter.

5.1.1.4 Academic position influences perception of LRM tools

Participants with an administrative load had more comments related to MOLÉ's usefulness because the system allowed them to 'be always present' in their classes even when they were traveling. It was inherent to their positions to go on official travel and to attend unscheduled meetings. At least four of the participants who were administrators reasoned about the convenience of utilizing MOLÉ when they were away on travel.

I can always upload or download information related to my class while I am on the go, and can check their work anytime that I want to. #2

I have to travel a lot during the semester, and I have no choice but sometimes to leave my class. So to avoid the gap in my lecture, I used the MOLÉ. I post online exercises. #14

With the online thing and with proper motivation of the students, that somehow they just have to keep track – since all the lessons are also there, it seemed that it really doesn't matter for being absent. #17

Even if I am in Europe, or even if I'm in America, but I'm always present. You will take note that I was always holding classes even with our international tours. #31

Participants with administrative load found using MOLÉ's LRM tools beneficial to them and their students because these participants said that they were always available. Students can consult them even though they were away from their classrooms. They were happy that they can keep their students informed and updated about their lessons.

5.1.1.5 Program level handled influences the perception of F&A tools

Participants who handled both the graduate and undergraduate programs differentiated the techniques they used for each level. For example, one participant varies the technique when conducting exams, while another academic changes strategy when assessing students' work.

> *In the graduate level, exams are not conducted like the one made for the undergrad program because it is dealt with independent research. There's no template needed. That's what I find as a challenge. #9*

> *[T]here is a huge difference because in the graduate program you can more or less leave your students by themselves. But in the undergraduate program you have to really guide them. #1*

It seems safe to argue that the main reason for the perceived usefulness of F&A features is based on the level of maturity of the students. Graduate level students are more self-regulated than undergraduate students. Furthermore, it is assumed that graduate students are more responsible.

5.1.1.6 Training mode attended influences the perception of I&C tools

Apart from discussion forums, self-trained participants do not use other I&C tools as often as those who were trained. Although self-trained academics were mostly comfortable in their use of technology, the use of I&C features was challenging only at the start. Apparently, self-trained participants were concerned that many academics had not been using MOLÉ because of the limited training slots.

> *It was challenging when I was just teaching myself. But now, I am already familiar with the features. At this stage I need to study the features of the new version. #4*

> *Some users did not know that they can do chat with MOLÉ. Others did not know that they can put discussions or create discussion groups in MOLÉ. #5*

Although most of the faculty members in our college are in the age bracket of about 22 to 40, at which this age are usually using technologies, but they don't really use much of MOLÉ, because maybe they were not trained and they don't have this idea of exploring other avenue of delivering courses. # 6

Participants who attended the training had mixed emotions regarding the training experience. Some were happy, and some were contented. However, it seems that there were some who were not confident to use the tools because the training was just an introductory session as claimed, for instance, by a participant:

I have least experiences. But on the training that I have attended, I got the idea that MOLÉ is good because it was demonstrated. The training session I attended was just a familiarization seminar. I did not have an in-depth appreciation and understanding what MOLÉ is, and what online learning is about. #10

This participant used other alternatives such as Google and Google Docs, Yahoogroups, and Facebook. He claimed that these systems were easy to use, and that he can easily connect with his students, aside from using these systems to upload and download files.

While participants from both groups were happy with the features of MOLÉ with respect to I&C, they expressed their desire to acquire pedagogical skills so that they can conduct online communication much better. Likewise, it is observed that well-designed training that can cater to the needs of particular groups appears necessary. Training constraint is discussed in a later section.

Overall, from the participants' viewpoints, the study demonstrates that academic discipline has the strongest influence on the usage of MOLÉ. Different disciplines have varied use of the system, yet the common reason shared by all participants was the convenience of using the learning management system. Administrators had higher levels of satisfaction in relation to the use of the system during their official assignments. In contrast, academics with graduate courses in MOLÉ found that pedagogy was different from undergraduate courses more specifically on assessing their students. Training was found to be most important so that facilitation and interaction with students especially in large classes can be conducted more efficiently.

While participants talked about the positive experiences in the drivers section, they also shared about the challenges and issues when using the system. Detailed discussions about

constraints are discussed in sections 5.2 to 5.5. Meanwhile, the next sub-section analyzes the participants' interaction with MOLÉ based on their log entries.

5.1.2 **Comparing system log usage with drivers dimensions**

Usage of the interactive and non-interactive features as well as those without logs, are analyzed in this section. In particular, the research uncovers why there are only few participants whose usage of interactive features is high. What are the common practices of the high-interactive users, and why do they differ from many of the participants whose usage of interactive features is low?

The sources or number of participants are indicated in the parenthesis as shown in Table 5-4.

Table 5-4: Differences in high and low usage per driver dimensions

DIMENSIONS / USAGE LOG ENTRIES	Learning Resource Management	Interaction and Communication	Feedback and Assessment	Teaching Performance	Fore-front of Innovation
Interactive usage (22/22)	X	Y	X	X	X
Non-interactive usage (22/22)	X	X	X	X	X
Without logs (11/33)	X	X	X	X	X

5.1.2.1 Perceptions of I&C influence the extent of interactive usage

System log entries have shown that the extent of interactive usage influences the perceptions of I&C tools because the study shows there is a big difference in the number of low users from high users. While most participants had been claiming that they were happy with the use of the I&C tools of the system, only three had consistently been recorded to have a relatively high use of this feature. All three participants said that they used the communication tools in their teaching strategy extensively. They designed the techniques to use for their classes because they were keen on their students' learning from the interaction, and the benefits that their students can get from interacting and exchanging ideas with their classmates.

Per cluster they have to discuss among themselves, and then we choose a theme, so from their discussions they are asked to choose one which they think will be the best argument for their group, and then the best argument for that group is discussed with the other groups. So, that's my technique – there's a way of group discussion online, at the same time, some ideas are already filtered. #18

Everyday, I should open my MOLÉ so that I can check my students' blogs, their activities, so that I can monitor them. #15

I maximize the use of almost all the tools like discussion forums, quizzes, assignments, journal, and rubric. I require my students to participate in all activities and giving their classmates their comments or reactions using forums during their class presentation. #26

The three high interactive users had a passionate attitude towards MOLÉ. They considered the difficulty that they encountered as mere challenges that can be solved by their own perspective on the situation.

While I might be slow in technically manipulating the computer, I liked very much the prospect of reaching out both person-to-person, and via Internet. That's my attitude in general....along the way, I learned how to handle the class, along the way also, I am able to trim down our requirements, or add some more. #18

I have a positive attitude and I really appreciated its features. I wanted everybody to also use MOLÉ because I find the system easy to connect with my students, let them collaborate on projects, and let them give feedback and comments on the work of others. However, we encounter difficulty. #15

I keep on motivating myself and my students to use MOLÉ because I can see that it has a big potential for keeping us updated with technological trends. I keep on telling myself that despite the limited resources, I should try to maximize everything that we have, otherwise, we cannot keep pace with the trends. Online learning is a trend, and for us teachers, we have to adapt to new technologies. I am very pro-MOLÉ so my dream is that all faculty members of our college will know how to use MOLÉ. I want them to experience my experience – MOLÉ is beautiful. For me it is a very productive tool. #26

Apart from their outlook about MOLÉ, these participants took their training seriously, and applied what were learned in their classes, which proved to be advantageous to them. They maximized the use of the features.

> *I think the most encouraging aspect of these all was after we were taught in module writing, present our output every session, and then after the training to experiment on our modules, then report to MICEL. Only very few actually did these, and I think perhaps only about three of us were the only ones who diligently followed instructions, and who would report. #18*

> *We were taught how to make quizzes, blogs, exams, but we thought it was very time consuming because we have to devote much time in making those quizzes. But when we tried MOLÉ we appreciated it because we were able to connect with our students. Students are able to collaborate. #15*

> *I attended an in-depth training which I appreciated because it has step-by-step instruction. I observed other faculty members did not take the training seriously at that time and that could be the reason why it was difficult for them. I have already used almost all the features of MOLÉ. For me, everything is okay. I like the tools and the activities. # 26*

The log entries have justified the claims of the high-interactive users. The insights that they shared are relevant to answering the question: why their log entries have shown high usage in all aspects, and in almost all categories. This shows that high interactive usage of these participants was outstanding for the following reasons:

- They used I&C tools as a teaching strategy. They designed their class requirements in such a way that students can interact, participate, and give their opinions about the work of their classmates;
- They had an accepting attitude, given the limitations of their current resources. They were also willing and prepared to share their knowledge and skills to teach other academics. They were not only concerned on teaching how to post learning resources online, but also on designing interactive classes, especially in their own departments; and

- They had been trained to use MOLÉ and found that the training was their stepping-stone to learn more. They had seriously considered training as a privilege, and that, training others to use MOLÉ can also enhance their own skills.

The inferences gathered from sections 5.1.1 and 5.1.2 are relevant to this study which helps in configuring the inter-relationships of the drivers dimensions. The inter-relationships are presented in the next sub-section.

5.1.3 Inter-relationships of the drivers dimensions

This section illustrates further the results of the interaction of the categories with the dimensions presented in the previous two sections. The inter-relationships of the five dimensions are illustrated in Figure 5-4, which is shown with two types of drivers: external and internal.

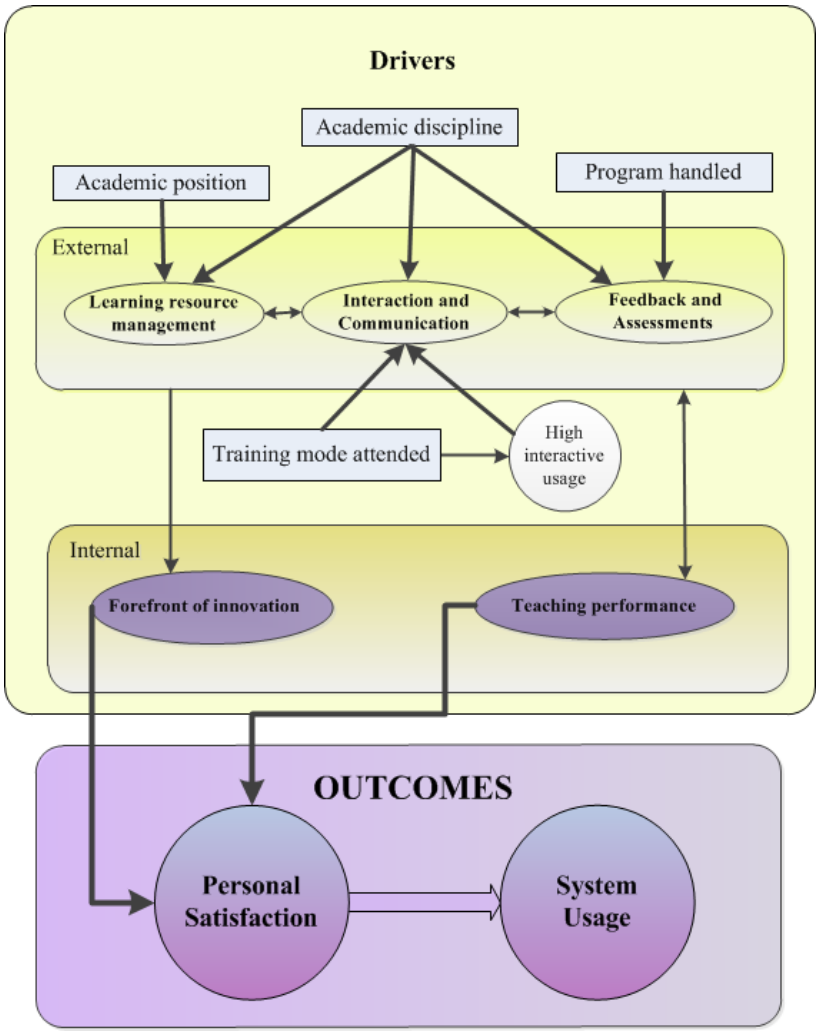

Figure 5-4: Inter-relationships of driver dimensions and categories that influence outcomes

5.1.3.1 External Drivers

The usage of MOLÉ is driven by external drivers effected by the system facilities that were used as tools by the users. Learning resource management (LRM) task and interaction and communication (I&C) task relate to each other. One of the justifications for this relationship is that, once learning resources are uploaded in MOLÉ, academics sent information to their students either thru discussion forums or thru email. As activities for the online classroom had to be communicated, discussed, and assessed, the relationships of these dimensions are to be established. Similarly, feedback and assessment (F&A) task relates to I&C tasks since the features of both tools support each other. The logic that when tests or assessments are given in the F&A dimension, there is always the likelihood that communication occurs. For example, this is justified in the education discipline where some academics use I&C as a teaching strategy using discussion forums, wikis, or journals.

The system facilities are in Figure 5-4 with four attributes (categories) that influence the MOLÉ tools. Results show that academic discipline is perceived to influence the learning resource management (LRM), interaction and communication (I&C), and feedback and assessment (F&A) tools. On the other hand, LRM and F&A are influenced by the participants' position, and program level handled, respectively. There are two inter-relationships worth noting: the relationship of academic discipline to the tools, and the relationship of I&C tools to the two tools and the system logs.

The relationships of academic discipline to the three tools signify that there are varied strategies necessary for delivering courses. First, LRM as a tool can cater to participants' needs as a repository, although it depends on academics to use it or not, as they see fit for their subject content. Second, I&C tools are easily available and can be maximized to its full potential, however, academics in different disciplines would likely use the tools depending on whether to use it only for distributing information, or as a teaching strategy. Third, F&A tools are touted to be the most useful for tests and exams but participants had two common constraints: preparation of tests and the need for a computer laboratory.

However, the results show a more complex inter-relationship of I&C tools. It is depicted to be central in three aspects. Firstly, it is bound by the two dimensions (LRM and F&A). The inter-relationships indicate that I&C tools are important features that have unique mechanisms for academics to reach out to students. The tools are innovative components that can differentiate the traditional face-to-face classes from a web-based environment. Secondly, I&C tools are perceived to be influenced by the number of trainings attended. Finally, the

high interactive usage is shown to be the result of training. High interactive usage is supported by the results from the system log entries.

5.1.3.2 Internal Drivers

Internal drivers are motivators emanating from within the participant. It pertains to the attitude towards the system – the feeling of how he or she has benefitted from using the tools. As shown in Figure 5-4, a one-way relationship from the external drivers is shown to influence forefront of innovation. The external drivers, which incorporate all three essential tasks of MOLÉ, influence the attitudes of the participants to some degree, like taking pride in using technology in their classes. This means that generally, participants saw that MOLÉ offered them an advantage among other academics in terms of using an available resource that helped them in the delivery of learning. For them, it enriched their experience, and made them more attuned to and updated with new innovations. Consequently, such experience, could enhance their skills. Being at the forefront of innovation leads to the notion of a satisfying use of MOLÉ (see Figure 5.4 where the arrow points towards outcomes).

Teaching performance is shown with a two-way relationship between the external drivers and the outcomes dimension. Participants' interaction with the system is shown to benefit from the tools because of the convenience on their part – on managing learning resources, interacting with their students online, and when conducting exams. Although results from log entries have shown that participants largely used the non-interactive features of MOLÉ, the study shows that participants perceived that MOLÉ has the potential to improve their teaching performance. The study shows that the two-way arrow represents that teaching performance drives participants' satisfaction and usage of the system. This also means that if the satisfaction is high, their motivation to use MOLÉ is high.

As a result of this analysis on the driver dimensions, the study shows that both the forefront of innovation and teaching performance drove the participants to use MOLÉ, however the level of satisfaction is not comprehensively gauged at this dimension. More influencing attributes are to be dealt with, in the succeeding sections on constraints, the first of which is learning environment constraints discussed in the next section.

5.2 Learning environment constraints

The learning environment constraints discuss themes that are related to issues and challenges in the use of the blended mode. These issues and challenges have been described in Chapter

4, which relate to four dimensions. The dimensions are discussed further in this section through a comparison of references by categories of the participants. The references are depicted in Figure 5-5 which shows the percentage of references made.

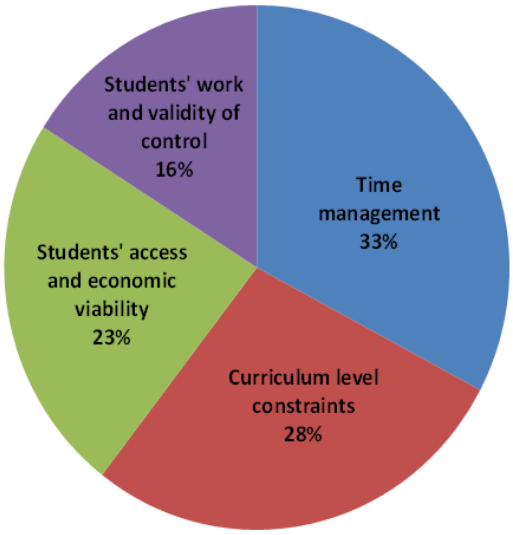

Figure 5-5: Learning environment constraints concept's set of dimensions showing the percentages of coded references

Time management has 33% of the total coded references from 25 sources, while students' work and validity of control has 16%. Related comments were gathered from 20 participants. Time management dimension refers to issues related to preparation of learning resources. Students' work and validity of control reflects the participants' element of trust in their students especially when these academics needed to conduct tests outside computer laboratories. That is, students can take the test in their own home, or in Internet café's, or wherever they can have computer access.

Curriculum level constraints dealing with issues related to program level, course descriptions and requirements has 28% of coded references from 27 participants. Students' access and economic viability, which were expressed by 21 participants, has 23% of coded references.

The comparision of the learning environment constraint concept is compared in the subsequent sub-sections, to answer the question why the references are relevant on the point of view of the participants' decision to use MOLÉ.

5.2.1 **Comparing demographic categories for learning environment constraints**

Table 5-5 shows that curriculum level, students' access and economic viability, and students' work and validity of control show differences in three categories. These differences are discussed in the following sub-sections.

Table 5-5: Differences between attributes within categories for each learning environment constraints dimensions

DIMENSIONS / CATEGORIES	Time Management	Curriculum level constraints	Students' access and economic viability	Students' work and validity of control
Academic Discipline	X	**Y**	**Y**	**Y**
Academic Position	X	**Y**	**Y**	X
Gender	X	X	X	X
Usage Mode	X	X	X	X
Program Level handled	X	**Y**	X	X
Training Mode Attended	X	X	X	X
Age Range	X	X	X	X
Teaching years	X	X	X	X
MOLÉ Semester Experience	X	X	X	X

5.2.1.1 Academic discipline influences the perceptions of curriculum level constraints

Generally, participants from group A in academic discipline category differ in their opinions about curriculum level constraints since their subjects were largely computational and involved problem solving type of subject content. In this type of subject, constant interaction with students was needed as put forward by some participants:

> *I can see that perhaps for descriptive subjects, it is okay. But I can't see it for calculations, because there are many ways of doing it. So, sometimes when interaction with students is necessary, using the system is difficult. There are times*

when we have to discuss instantaneously, we can see a solution to the problem, so I can see the advantage of doing it face-to-face rather than online. #8

I did not use it because in Engineering it's more or less a face-to-face meeting, especially for subjects which require analytical and problem solving. #1

Yes, I have attachments for some lectures then, I think, yes for descriptive type courses, it's more okay, but in problem solving it's difficult. #33

In group B however, although most of them had descriptive type of subjects, they were mostly enthusiastic to use MOLÉ because, for them, it was convenient to use. They were skeptical to use MOLÉ in non-descriptive types of subject content.

It maybe somehow used as a tool, in some subjects, but in my class it becomes really part of my instructional strategy. #4

I think not all subjects can be place on distance mode. Perhaps, descriptive subjects and subjects that have lots of resources are possible. #9

Similar to other academics from other groups, participants from group C can choose what subject they would like to deliver online because, although they were encouraged to use MOLÉ, they were not compelled (or mandated) to use it.

5.2.1.2 Academic discipline influences the perceptions of students' access and economic viability

Access and economic viability of the students were problems that affected participants because a large percentage of the students do not have their own computers. The most affected participants were from group B whose academic discipline belonged to non-laboratory courses.

If it is not a technology-related subject I arrange for a lab usage scheduled on a vacant slot in our computer lab. Otherwise, I make arrangement with the teacher who is using the laboratory at that time. #4

You cannot expect to have replies right away when homework is online…only a few have computer and access in their homes…for these reasons there are many who cannot submit on time. #18

Participants from other disciplines were also affected because students become obliged to go to Internet cafés for their online activities, thus most participants said that they were concerned about the safety of their students.

> *Sometimes I am scared because, say, if the student goes out of his or her boarding house at night, and what if something happens outside, or on his way to the Internet café or going back home? That's scary because if it's found out that the reason why they are out is because of your class and yet we don't have that policy. #5*

5.2.1.3 Academic discipline influences the perceptions of students' work and validity of control

Work and validity of control was seen differently from the point of view of participants from group B. Most of them were affected by the non-availability of a computer laboratory to hold their classes in a single meeting or venue; and more importantly, when tests were supposed to be online.

> *I am concerned about the security like how we can put measures to protect the test items? Also, we cannot do online test outside the laboratory. I need a laboratory so that I can watch them during tests. I usually say no to my students if they ask to take exams at their home. #14*

> *It is practical to have a hybrid mode rather than purely online… at least we can develop the maturity of the user, and along the way also we can improve the control systems to ensure that those participating on online are the real students. #17*

> *The type of interaction that I usually find satisfaction is when the student is able to probe deeper into an issue, given a particular set of readings, and be able to see the connection between these readings and that's difficult to do in teaching online. [Perhaps that's my frustration in teaching online]. And [therefore it is much better with hybrid] because you are able to check. #18*

The study shows that problems with conducting tests online are related to computer facilities. Academics' common concern was to conduct exams only in computer laboratories on campus, with their presence because they needed to ensure that students were prevented from cheating.

5.2.1.4 Academic position influences the perceptions of curriculum level constraints

Perceptions of curriculum level constraints differ because academics with an administrative position talked about how MOLÉ could be used effectively as a delivery for teaching and learning. However, an administrator contended that MOLÉ was a good facility when the course has a laboratory component. Therefore, courses for online delivery will need to be selected accordingly. Other administrators who were directly involved in MOLÉ also contributed that:

> *Most of the complaints of academics in various colleges is that they cannot make use of MOLÉ because of Internet connection, and availability of computers in their respective colleges and departments. #4*

> *There are many teachers who use Internet, but not necessarily in MOLÉ; and they think it is online…We're trying to propose for a set of policies governing online teaching. And one of the basic components of one policy is: only the department can determine which subjects should be taught online… I wish that there was a more comprehensive study of what this is all about so that the needs can really be captured. #18*

Non-administrators were more concerned about their courses and the problems therein if they do not have a laboratory component. Their apprehension on this mode was related to the safety of their students.

> *One issue there is if you don't have a laboratory component for your subject then, I guess it will be difficult because we don't have a big open laboratory in MSU-IIT. We are worried that our students will have to go to Internet café's and other areas. #3*

> *Only those which have a laboratory subject can effectively use MOLÉ. Even our library does not have the sufficient number of computers to cater to the number of students in our college. #10*

In this category, the two groups had referred to the issues and challenges differently. However there was still a common outlook, which was the need for computer facilities in all colleges.

5.2.1.5 Academic position influences the perceptions of students' access and economic viability

Students' access and economic viability have a bigger effect on non-administrators compared to administrators. Non-administrators talked about how the university should respond to the need of providing the facilities for the students in addition to the problem of students' access. In constrast, administrators were more concerned about their courses and their students' capabilities:

> *We have problems for those coming from the low-income group, where they cannot afford to go to the Internet, nor buy their own laptop. They are the ones that are disadvantaged. So maybe, if we plan to go into this mode, we will have to provide facilities. #14*

> *I wish there were better ways in accessing the Net, because students are forced to use personal funds just to access the Net outside (of campus). It is only very recent that there are WiFi areas on campus….of course this pre-supposes that the students have computer. …Many of our students come from poor families and therefore wouldn't have access or do not have personal computers themselves. #18*

> *I often heard complaints from undergraduate students …that they have difficulty in accessing MOLÉ because they do not have their own computer. They have to go to Internet café's even at nighttime to access MOLÉ. #1*

> *In IIT you cannot force the students if they don't have computers at home, or if there's no Internet connection at home. #3*

> *About 40% have similar problems, like spending for use of computer at Internet café. Although I used to tell them that we have hotspots in the campus, they only have to bring their laptops, and that they can also go to the library for free access. Well, students are not that enthusiastic, perhaps. So, my usage started to decrease. I slowly shifted, but still, I need to have an online environment. I shifted to other venue which is not MOLÉ. #23*

Clearly, academics were affected by the students' economic capabilities. Moreover, academics cannot force their students to use MOLÉ since there is no mandated policy to use

it. Administrators are more vocal about having a policy in view of students' access and economic viability.

5.2.1.6 Program level handled influences the perceptions of curriculum level constraints
Participants with higher degree courses were more inclined to constantly use MOLÉ for the following reasons: graduate students are mostly professionals and working; are more mature and independent; and they can afford to buy their own computer. Also, several graduate students came from distant provinces and cities. Whereas, undergraduate courses, especially for participants with large numbers of students, had issues related to the availability of computer laboratories, particularly for the conduct of tests.

> *Usually graduate students are only available at night, or during weekends. If with the help of MICEL and instructor can create modules for the classes in the MBM program, I think that's a very good start… our university can really go into full online delivery... I think it is the course that best fits the online mode of delivery. #5*

> *MOLÉ is very useful especially for the graduate students. Because I have graduate students from different places…so they wanted to have our lectures on MOLÉ. #33*

> *If only we have a computer lab where students can take the exam…where it can accommodate 50 students that we have, I can settle for that, even if the other 2 or 4 sections cannot take the exam at the same time….at least students can take the exam at the same time per section. #28*

The study indicates that the usefulness of MOLÉ in higher degree / graduate courses is repeatedly mentioned by the participants because of two aspects: graduate students have easy access to MOLÉ, compared to undergraduate students because they can afford to buy the computer, or they can access MOLÉ in their respective workplaces.

5.2.2 **Comparing system log usage with learning environment constraints**

As shown in Table 5-6, there is interaction that occurs between interactive usage and curriculum level constraints. The extent of interactive usage influences perception of curriculum level constraints which is discussed next.

Table 5-6: Differences in high and low usage per learning environment constraints dimensions

DIMENSIONS / USAGE LOG ENTRIES	Time management	Curriculum level constraints	Students' access and economic viability	Students' work and validity of control
Interactive usage (22/22)	X	**Y**	**Y**	X
Non-interactive usage (22/22)	X	X	X	X
Without logs (11/33)	X	X	X	X

5.2.2.1 Perceptions of curriculum level constraints influence the extent of interactive usage

A big number of participants have been recorded to have low interactive usage based on log results because of the effects of curriculum constraints. Curriculum constraints have been identified as issues that relate to course description and requirements. Participants have low usage of interactive features like using interaction and communication tools, and feedback and assessment tools. Participants claimed that one of the major issues was the students' accessibility due to economic reasons. Below are some of the coded references gathered:

> *Because in other subjects, I just require assignments, and then I just set the deadline, so connection is not a problem. But then if students are in the same laboratory and then you want them to have the feedback, it is problematic. #4*

> *I used the quiz feature but the problem is, I cannot bring together the students at the same time. That's the problem. And, we don't have facilities to have all 45 students using 45 computers. #13*

I wish there is a computer room where we can use for certain activities that needed computer. There are some wild imaginations that I wished that it were possible for an interactive activity for my class. That may take long to materialize. #23

The issue about computer facilities that have also been discussed in section 5.2.1.4 is in the low interactive usage of MOLÉ.

5.2.2.2 Perceptions of students' access and economic viability influence the extent of interactive usage

What has been said by participants in section 5.2.1.2 referring to students' access problems are in their low interactive usage. The common tendency of the participants was to decide not to use MOLÉ because of the large percentage of students who do not own computers. The issues and coded references are closely related to the discussion mentioned in the previous section 5.2.2.1 and section 5.2.1.4.

5.2.3 **Inter-relationships of the dimensions learning environment constraints**

The inter-relationships of the learning environment constraints concept are shown in Figure 5-6. The four dimensions are shown to impact outcomes. The links from the dimensions to outcomes are discussed in section 5.5.

Time management is considered an internal dimension which specifies that this dimension can be controlled by the participant. For example, he/she can say that he/she wants to use the system but does not have the time to develop materials, or he/she enjoys using the basic features of the system but he/she needs more time to learn other features, etc.

There is a strong relationship between time management and curriculum level dimensions. This link is justified from the coded references like requirements of the course in particular reference to laboratory component, or the description of the subject itself, like being a descriptive or problem-solving type of course.

A strong relationship exists between curriculum level constraints and students' economic viability. The coded references from the participants indicate the specification of their non-technology based curriculum. Prominent comments were gathered that generally, students who cannot afford to have their own computer faced more challenges in terms of access.

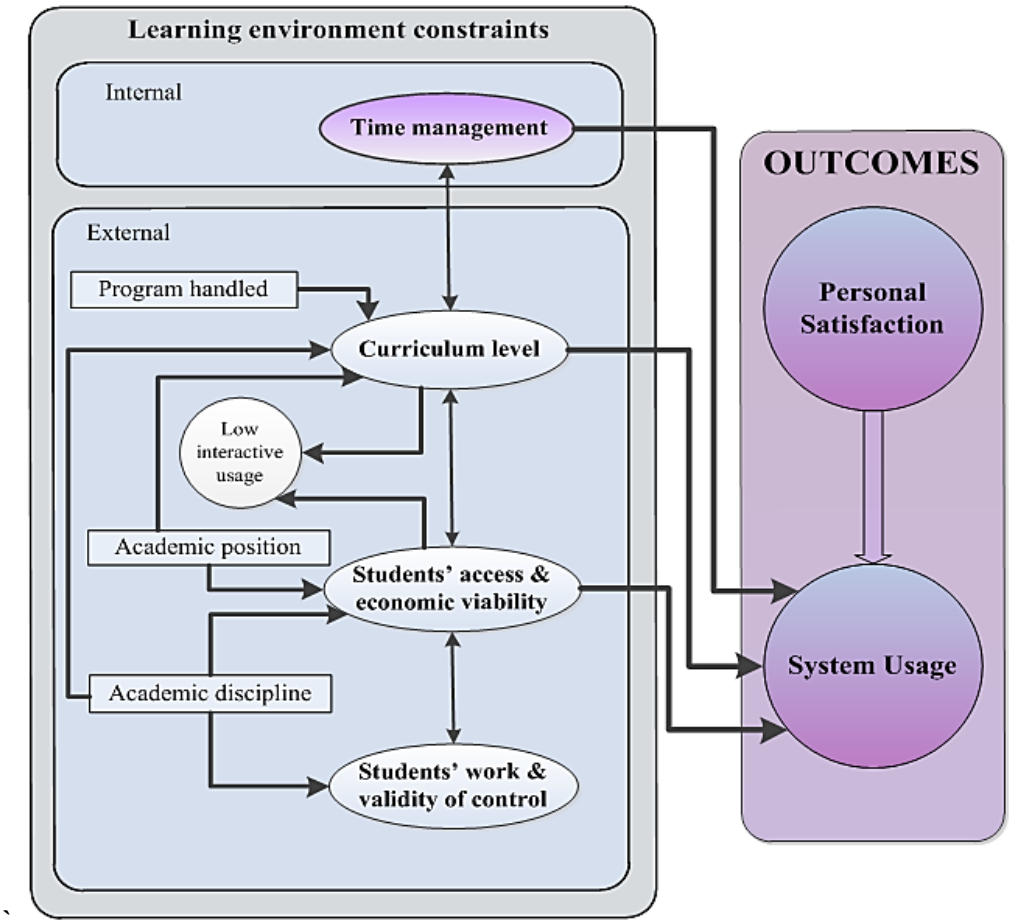

Figure 5-6: Learning environment constraints dimensions impact on outcomes

In connection with students' work and validity of control, a link with students' economic viability exists because of the element of trust as mentioned before. Participants had challenges – that there is no standard guideline for MOLÉ use, as well as establishing some of their assessments and grading based on the merit of their students' work.

Per comparison of categories in the preceding sections, the study indicates that the program handled by academics influences the perception of curriculum level on the context of undergraduate and graduate courses. On the other hand, both academic position and academic discipline influence the dimensions of curriculum level, students' access and economic viability, and students' work and validity of control. Among the four dimensions of learning environment constraints, these three are external influences that a participant does not have control of. Whereas, time management is internal to the participant and the use of MOLÉ is based on his/her own discretion. Coupled with a strong motivation, the participant can control or manage his or her time to prepare learning resources or practice the use of MOLÉ.

Based on the system logs, the study also shows that low usage of interactive features is strongly influenced by students' economic viability and access. The system logs justify what has been shown in the coded references as influenced also by academic discipline and academic position. The low interactive usage encompasses the use of non-interactive features which indicates that academics decide on using MOLÉ depending on the situation, such as for submission of assignments, or for posting lesson notes, as most academics are not compelled to use MOLÉ for their classes. Although some of them choose to use MOLÉ consistently, many of the participants decide to do so if their students are amenable to its use.

5.3 Training constraints

There are four dimensions comprising the training constraints concept. The references to each of the dimensions are shown in Figure 5-7 with needs assessments having the highest percentage, equivalent to 46%. The other dimensions and their percentages are policies with 25%, design has 21%, and services having the least references, equivalent to 8%.

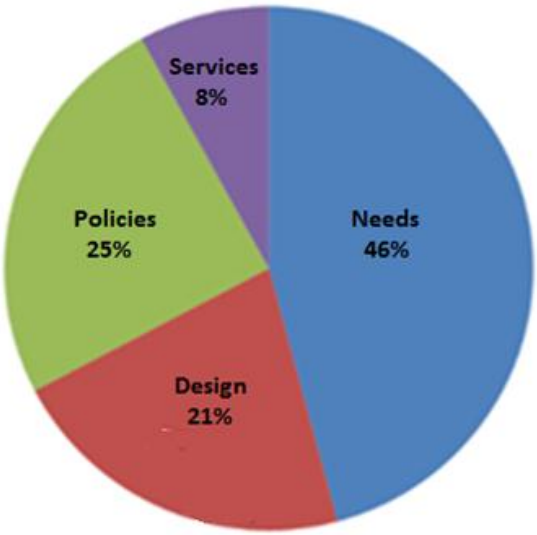

Figure 5-7: Training constraints concept's set of dimensions showing the percentages of coded references

The needs assessments are issues referring to most of the participants' difficulty in using the system, their lack of skills on MOLÉ features, and their training needs on system usage. Even their skills that were needed for developing learning materials, such as incorporating multimedia elements and preparing interactive materials, were necessary for them to acquire

training. Academics were also concerned with their students' lack of usage skills. This was among the issues discussed by many participants.

Policies that pertain to training such as how it is to be conducted, who can attend the training, and conditions of training, are discussed in this dimension. On the training design dimension, participants had some suggestions on how training should be planned, and what should be the contents of training for each of the different sectors of the university. Training services dimension relates to issues pertaining to call assistance, or a helpdesk that can be referred to by users for basic or immediate needs.

The inter-relationships of this dimension are discussed next.

5.3.1 Comparing demographic categories for training constraints

As shown in Table 5-7, this concept is viewed differently from the three categories and

Table 5-7: Differences between attributes within categories for each training constraints dimensions

DIMENSIONS / CATEGORIES	Training Needs	Training Design	Training Policies	Training Services
Academic Discipline	**Y**	X	X	X
Academic Position	X	X	**Y**	X
Gender	X	X	X	X
Usage Mode	X	X	X	X
Program Level handled	X	X	X	X
Training Mode Attended	X	**Y**	X	X
Age Range	X	X	X	X
Teaching years	X	X	X	X
MOLÉ Semester Experience	X	X	X	X

dimensions: academic discipline and needs assessments, academic position and policies, and training mode attended and training design.

Academic discipline influences perceptions of training needs. The perception of training needs vary wherein the three groups of academic disciplines have different academic backgrounds and skills. Technically inclined users, coming from groups A and C were happy with basic training; whereas, group B participants were more enthusiastic to learn from the training at all levels.

Participants from engineering and science disciplines were more self-reliant when it comes to training needs. Most of them needed only the basic training. Also they can learn to use advanced features themselves. In contrast arts and education participants wanted to explore other features via training.

> *I really wanted to use the assessments features, but I haven't really gone into, because one semester is just really a short time for me to really use all the functionalities of the program. #25*

> *Our training on MOLÉ did not include the basic skills on how to make use of necessary things that you will need to put in place the resources. I was deficient with these skills…..Also, how could I translate using MOLÉ in my problem solving subjects? That is a challenge for me. I thought of using video, then post it, but I know it will take time to develop. #9*

Participants from courses that have technology content in their subjects were more concerned with the training needs of other academics coming from non-technology courses. Furthermore, they were confident with their technological skills, however, they were more concerned about their insufficient pedagogical skills.

> *The teachers in IIT especially in the Arts and Social Sciences don't use the system because they may be hesitant to use the technology. But if we can train them, we can help them and maybe they will be using the MOLÉ. #3*

> *Primarily, users are not really trained to use the system. One of the challenges for MOLÉ usage is educating faculty members to make most of the capabilities that is available with MOLÉ. #6*

> *I still need a training on how an online course should be done, using Moodle, specifically. Because what I only do in my classes, I just upload the resources, and just set-up quizzes there, but I really don't use 'WebQuest' and other online techniques. #5*

Overall, the training needs of the participants from each discipline cannot be a gauge on what training was more appropriate for a specific group. Individual needs have to be

comprehensively assessed because it was only the individual who can personally identify what skills they lacked.

5.3.1.1 Academic position influences perceptions of training policies

Perceptions of training policies differ from participants with and without administrative positions because administrators looked at training policies based on the need of academics to be trained.

> *We have to have teachers that are flexible enough to really make use of that. And also, if there are problems, they should not hesitate from retooling themselves and learning things. These are requirements for some teachers. #2*

> *It is a challenge because it is not required for our teachers here at MSU-IIT. Compared with the University of the Philippines (UP) …it is a requirement that the applicant has already undergone the training for about six months on pedagogy. They cannot teach when they have not undergone a training on pedagogy online. #12*

> *[D]o we have enough funds for training all the faculty? Or, have we really done needs assessment that is comprehensive, so that we are able to identify who first to train? Meaning, can we rationalize the training and the schedule? So that we are able to understand who needs this kind of training at what time, for what? #18*

On the contrary, non-administrators were more concerned with the effects of the existing training policies in the university wherein the number of academics who can be trained from colleges or departments were limited. Apart from that, a training fee was required, which was charged to the college.

> *Training has to be conducted for all the teachers in the college …the chance of having the training is very slim because…only two participants for every department are allowed at one time, and the training fee will be taken from the college fund. Why not make it free to faculty members? #28*

> *Before, there was a memo order from MICEL to select faculty member who will undergo training. During that time only a selected few from our department is sent on training because the training is expensive. #10*

Overall, academics were constrained with the existing policies; thus this issue has to be passed on to the executive management of the university to closely examine the emerging issues due to existing policies.

5.3.1.2 Training mode attended influences perceptions of training design

Training design is perceived differently by those who were trained and self-trained because participants have varied skills. There is no common viewpoint from different groups. However, the suggestions and experiences are worthy to look at because these have implications for training design.

> *For the new ones, make it simpler. For advanced users, it can progress to a different level. That means, develop a training to have it by level. Appreciation is very important because once the interest is triggered, appreciation of the system is there. #8*

> *In the department, my colleagues often ask me how to use MOLÉ. Most of them are interested. There were only 4 of us in our department who attended the in-depth training. Other co-faculty members who were in attendance did not take the training seriously at that time. #26*

> *I had training with MICEL, however, I could not really put those learnings in practice, and suddenly I just forgot how to do all those things. Perhaps I need refresher programs. #11*

It can be observed that the major difference of trained and self-trained participants is the level of their technological expertise and attitude. Some of those trained, who were not technically inclined, did not advance in the use of MOLÉ. Others who had undergone training were happy to share what they learned. Overall, the experiences of the participants' could be used as a basis for designing a training module/guideline for each sector in the university.

5.3.2 **Comparing system log usage with training constraints**

As in Table 5-8, system logs show that training policies influence the extent of usage of non-interactive features of MOLÉ. These are explained below.

Table 5-8: Differences of high and low usage per training constraints dimensions

DIMENSIONS / USAGE LOG ENTRIES	Training Needs	Training Design	Training Policies	Training Services
Interactive usage (22/22)	X	X	X	X
Non-interactive usage (22/22)	X	X	Y	X
Without logs (11/33)	X	X	X	X

5.3.2.1 Perceptions of training policies influence the extent of non-interactive usage

Log usage shows that there is a large number of low non-interactive users of MOLÉ because, at this stage and time, there is no institutional policy yet that recognizes MOLÉ as a complement to the delivery of instructions in the university.

Aside from the training policy issue, a training manual, or interactive video material to be used as a self-guide manual for some academics and students was also a basic need. Thus, supporting materials for training cannot be produced without training policy.

> *I have always declared…we haven't undertaken training for many faculty. While some faculty claim that they are doing teaching online…we haven't really had these policies approved so that they can be implemented regarding regulation of online teaching… because it is prone to abuse. #18*

> *The issue is, it's not really very easy to use…and making it user-friendly, and if it's not user-friendly, can we have the manual please, so we don't have to go through the training?#19*

> *I wish MOLÉ has a tutorial that is interactive, like – somebody, a teacher should explain how to open, how to click the syllabus and everything without the teacher being there – that is not true to MOLÉ. With MOLÉ, for the first meeting you have to be there. #22*

The study has shown that usage of the system is dependent on both training and university policies.

5.3.3 **Training constraints dimensions inter-relationships**

The inter-relationship of training needs, training design, and training policies impacting on outcomes, is shown in Figure 5-8.

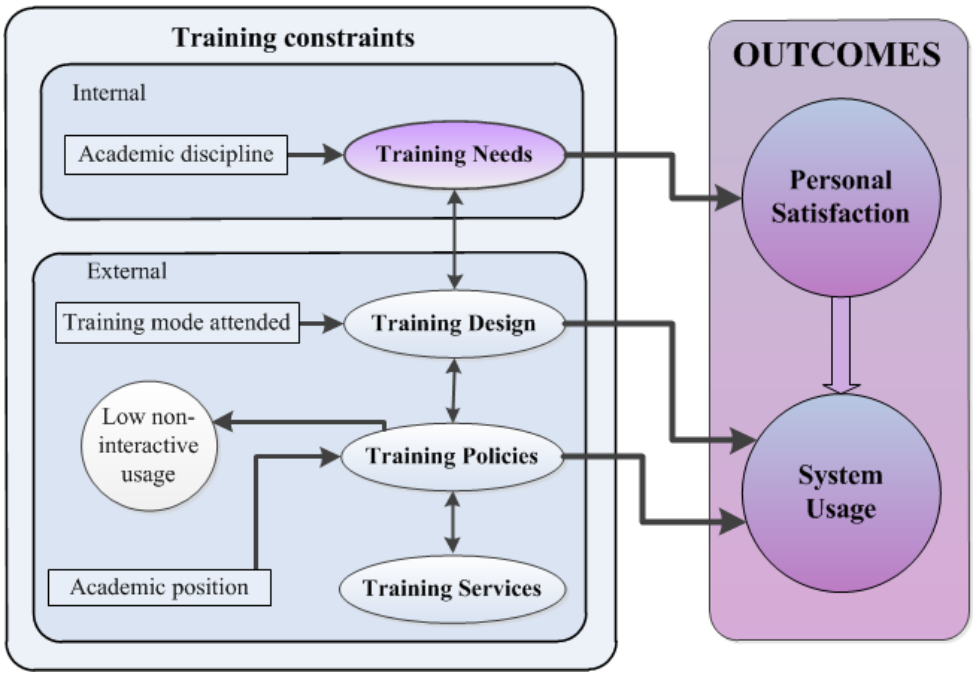

Figure 5-8: Training constraints dimensions impact on outcomes

The three dimensions namely: needs assessments, training design, and training policies, are perceived to be influenced by academic discipline, training mode attended, and academic position, respectively. On further scrutiny of the log data, this indicates that low usage of non-interactive features is dominant, as shown in the diagram. This holds true for low usage of interactive features. The interaction of interactive or non-interactive features with training policies does not necessarily have to be viewed per se. It points to the fact that MOLÉ as a tool should be looked into.

In the analysis, a strong relationship was established between needs assessments and outcomes. This implies that when academics have insufficient training, it is more likely that the maximum potential for MOLÉ to be used is low. There are features that academics wanted to use, especially with the interactive features; however, they cannot use these due to their lack of training, or their lack of time to develop the skills by themselves.

The relationship between policies and outcomes is strong. From those interviewed, academics who had undergone training have shown enthusiasm in using the system, and most of them

had applied what they learned. They were concerned, however, for their colleagues who were not yet given the opportunity to be trained, because of fund allocation which was on a per college basis. Funding for training was a disappointment for academics since not everybody in the department can be trained. The participants' notion was to make training available to all academics interested in using MOLÉ for their classes.

A moderate relationship exists between needs assessments and design, design and policies, and design and outcomes. This relationship attests to the interest of most academics to advocate the use of MOLÉ, and strategically use it, given the needed training.

External to the training concept constraints are linked to institutional level constraints. A prominent link is a strong relationship between needs assessments and institutional level constraints. Most academics contend that a university policy has to be established that could cater to the needs of students and academics in terms of training.

5.4 Institutional level constraints

The third among the environmental constraints is institutional level constraints which have two dimensions: university policies, and network infrastructure and computer facilities. Figure 5-9 illustrates the percentage of references made for each dimension where network infrastructure and computer facilities garners 59% of the total references while university policies have 41% .

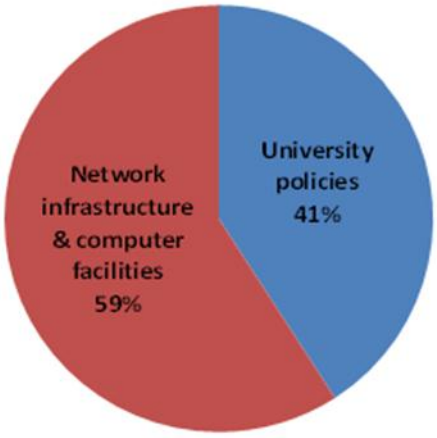

Figure 5-9: Institutional level constraints concept's set of dimensions showing the percentages of coded references

Connectivity and speed of the Internet are the main issues raised on network infrastructure and computer facilities. On university policy issues, participants had problems on the support of the management, such as training, improvement of laboratory facilities, and instituting a policy on usage.

5.4.1 Comparing demographics for institutional level constraints

Comparing the different categories across the two dimensions are presented in Table 5-9 and explained in the sub-sections that follow. As shown in the table below, two categories (academic discipline and academic position) are influenced by perceptions of university policies, and network infrastructure and computer facilities.

Table 5-9: Differences between attributes within categories for each institutional level constraint's dimensions

DIMENSIONS / CATEGORIES	University policies	Network infrastructure and computer facilities
Academic Discipline	X	Y
Academic Position	Y	X
Gender	X	X
Usage Mode	X	X
Program Level handled	X	X
Training Mode Attended	X	X
Age Range	X	X
Teaching years	X	X
MOLÉ Semester Experience	X	X

5.4.1.1 Academic discipline influences the perceptions of network infrastructure and computer facilities

Reactions of participants from different disciplines were varied because of their personal opinions and their view of the usage of the system, which was dependent on their tasks. There are three perspectives that prevailed. The first perspective views the system as a teaching

strategy. The second is accessibility. Finally, the perspective from a participant who was directly involved on training.

> *Looking at different academic fields in our university, unlike those in the engineering, for example, we do not have that in our college…I wish there is a computer room where we can use for certain activities that needed computer. #23*

> *[W]hen students are outside the campus supposed to be they can access the materials easily which is the problem as of now, because our connection outside the campus is not really that good. #24*

> *They always complain in their colleges about Internet connection – the bandwidth – especially in College of Arts and Social Sciences. They also do not have computer labs. There is also just one router in that area. #4*

Academic discipline affiliation appears to be one of the challenges in using MOLÉ. Usage is restricted because access to computer facilities even in their own department offices, is limited. For example, the College of Arts and Social Sciences has at least six departments. For each department, there are about five available computers that could be used by at least 15 full-time academics. Since their academic disciplines are not technology-based, they do not have the same computer facilities that other colleges and schools have. This was the main reason why most participants oftentimes complained about facilities.

5.4.1.2 Academic position influences the perceptions of university policies

Administrators were vocal about the issues because of the stringent policies that must go through the executive management of the MSU System (through its Board of Regents) before MOLÉ can be used formally (that is, as a mandated and recognized vehicle for instructions). Administrators were aware of the potentials of MOLÉ and the benefits for the academic community and the prestige it can bring to the university. Administrators aspired to have related policies which the university currently lacks. Executive administrators who participated agreed that formalizing MOLÉ as online delivery tool can be done; however, accordingly, there were plenty of challenges and stringent measures to think about before it can be effectively instituted.

> *[W]e are trying to propose for a set of policies governing online teaching …I don't know if these policies have already been approved. …I wish that there was a more*

comprehensive study of what this is all about so that the needs can really be captured. #18

[R]elated to the challenge is basically convincing at least from the point of view of an administrator, convincing the system administration of MSU that online can be done, and can be implemented…. Ultimately, we need to have campus-like policies on online learning and that really encompass a lot in terms of …what will be the structure of fees…how do you compensate for any level of effort for somebody doing pure online?. #17

[W]e are yet on a "make-use" stage… We thought before that we could do it. But we realized when we "touched the ground" that there's so many things that must be in place before we can do it effectively. #2

On the other hand, non-administrative participants opined that MOLÉ usage could increase if there was a wider acceptance from their administrators in their colleges or schools.

Our school administrators have to be computer literate, and should know and understand what the distance mode is all about. #9

In my opinion, if we want to use it, the administration should enforce it. Faculty members should not just be left on their own to decide using it based on their interest to use. In my viewpoint, it will be difficult to implement based on that. #25

There are very many who make use of the Web for their instruction and many of the administrators are dampening their spirits. #13

This research indicates that MOLÉ is not widely accepted at this stage in most colleges and schools as there is a high percentage of the college and school deans who are not enthusiastic to use the system.

The study also shows that the challenges on network infrastructure and computer facilities are critically linked to university policies, hence, the interaction between these two dimensions is strong. Moreover, usage mode influences the perceptions of both dimensions at which the difference on what the different groups said were already mentioned on the previous comparisons.

Challenges in both dimensions can be verified on the system logs which are discussed next.

5.4.2 **Comparing system log usage with institutional level constraints**

Interactive usage is shown in Table 5-10 as having interaction with university policies, and network infrastructure and computer facilities. This interaction is further explained in the next sub-section.

Table 5-10: Differences of high and low usage perinstitutional level constraints dimensions

DIMENSIONS / USAGE LOG ENTRIES	University policies	Network infrastructure & computer facilities
Interactive usage (22/22)	Y	Y
Non-interactive usage (22/22)	X	X
Without logs (11/33)	X	X

5.4.2.1 Perceptions of university policies influence the extent of interactive usage

As to what has been said in section 5.4.1.2 by participants from different groups, the effects are verified from log data. The large percentage of low interactive usage show that the results are encompassing that of low non-interactive usage features of MOLÉ. The coded references are not unique from what has been previously stated. Overall, participants commented about relating usage to non-existent university policies and the outlook of having implementing guidelines in place.

5.4.2.2 Perceptions of network infrastructure and computer facilities influence the extent of interactive usage

The extent of interactive usage is dependent also on network infrastructure to which coded references have also been previously presented in 5.4.1.1. Most of the comments are inter-related to university policies. In 5.4.1.1, findings suggest that academic discipline influence the perception of online interaction.

5.4.3 **Institutional level constraintsdimensions inter-relationships**

The inter-relationships of the institutional level constraints are depicted in Figure 5-10. Both the network infrastructure and computer facilities and university policies strongly impact on

the outcomes. These relationships are established; as shown by the number of coded references made, and the number of sources that commented on the dimensions. Twenty nine participants talked about university policies while four participants have no related comments. Interestingly, the four participants belonged to four varied categories of users:

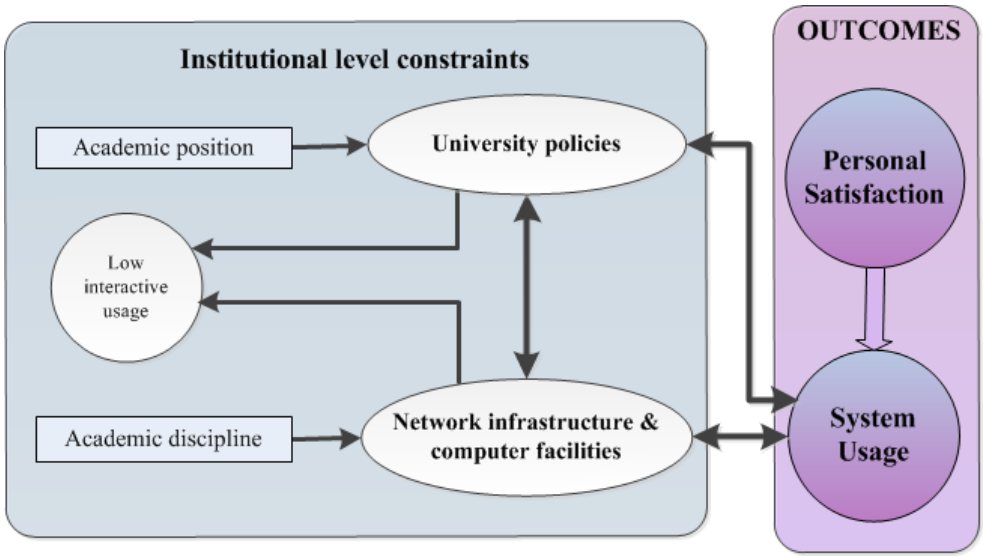

Figure 5-10: Institutional level constraints dimensions impact on outcomes

(1) a supplemented user who was a heavy user of MOLÉ and supplemented her teaching strategy with social network sites like Facebook and Wikis;

(2) a non-user who has not used MOLÉ but used Facebook to reach out to students and accommodated students for consultation;

(3) a self-trained user of MOLÉ who used it for uploading learning resources and giving links to student ts. However, this academic used a system (similar to MOLÉ built by his department using (Moodle) to conduct tests and exams in computer laboratories on campus; and

(4) a previous user of MOLÉ who finds it cumbersome to use the system, hence has decided to use a different system for technology-related classes.

Although the four participants did not categorically comment on university policies, three of them talked about network infrastructure problems. Thus, 97% talked about network infrastructure and computer facilities, topping all other dimensions mentioning about constraints. Overall, the study shows that a strong relationship exists between the two dimensions. Research indicates that both dimensions are inter-dependent.

5.5 Outcomes

Outcomes as a concept have two dimensions: user satisfaction and system usage. Figure 5-11 shows the percentage of references for each of the dimensions. System usage is shown as having 68% of the total coded references for outcomes, while user satisfaction has 38%. All of the 33 participants provided comments on both the user satisfaction and system usage.

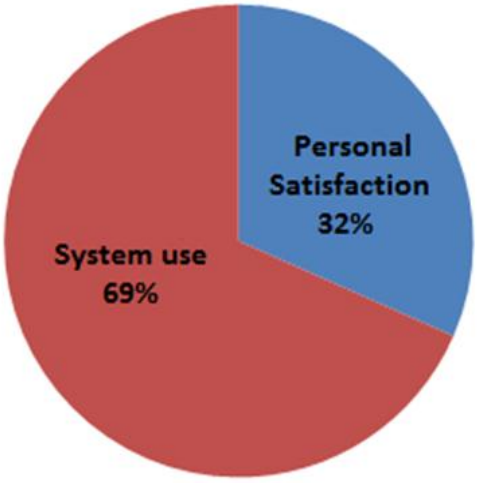

Figure 5-11: Outcomes concept's set of dimensions showing the percentages of coded references

The previous sections discussed drivers and constraints and presented how these concepts impacted on outcomes as a whole. Academics' positive coded references have been discussed in section 5-1 (drivers section) while issues and challenges were discussed in the three constraints sections: 5.2 learning environment, 5.3 training, and 5.4 institutional level.

Also, each of the concepts was discussed with the concept model adjacent with the outcomes model. The inter-relationship of outcomes is configured as having user satisfaction with a solid arrow towards system usage. This indicates that user satisfaction has a substantial effect on system usage. The essence of the effects of user satisfaction to system usage and its relationship are further discussed in the sub-sections below. Discussions are referred to the detailed outcomes model illustrated in Figure 5-12.

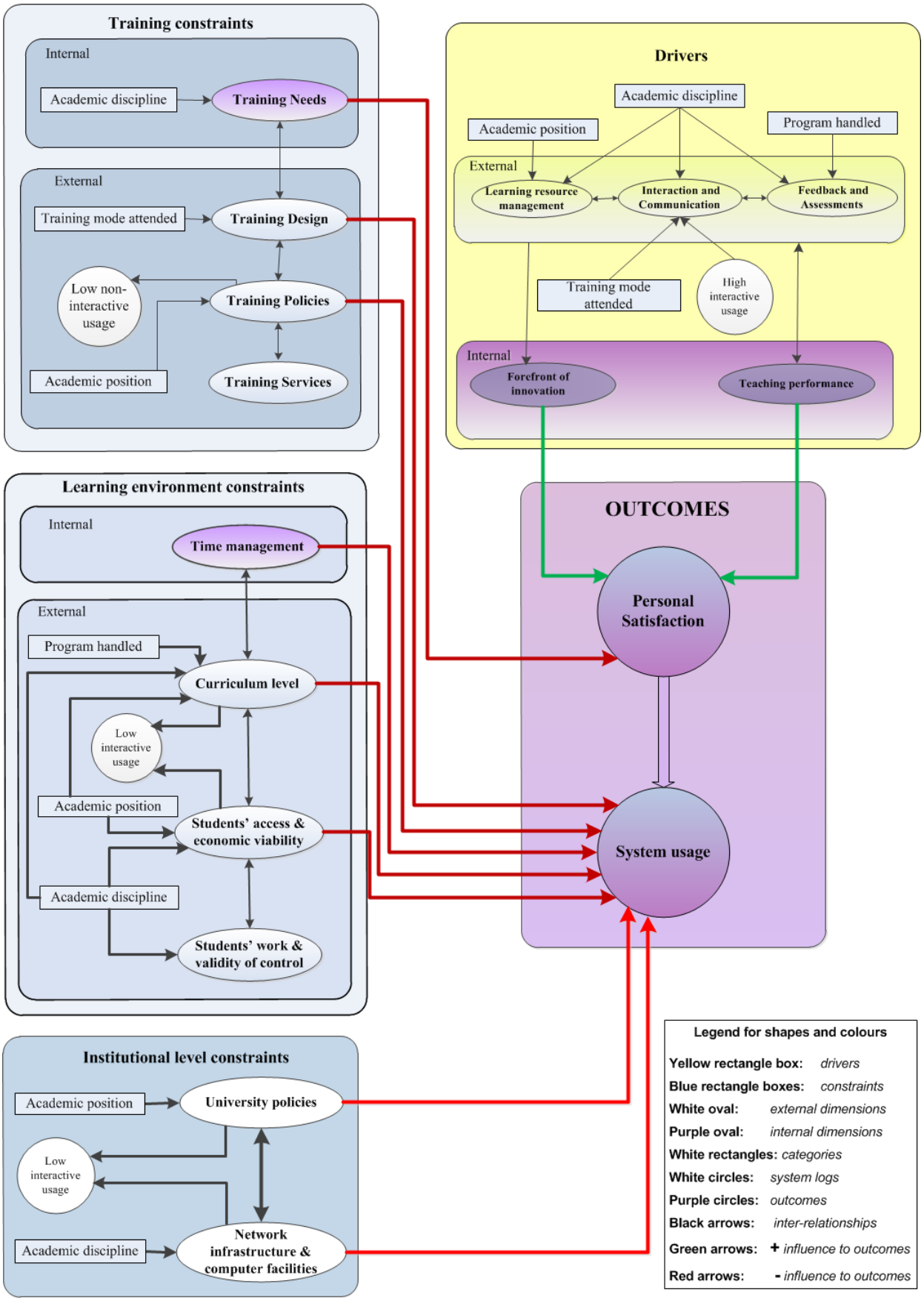

Figure 5-12: Drivers and constraints impact on outcomes

There are ten dimensions that influence outcomes, three of which are directly linked to user satisfaction (forefront of innovation and teaching performance from the drivers concept; and training needs from training constraints concept). The relationships are discussed in sub-section 5.5.1. Seven dimensions are directly linked to system usage outcomes. These are discussed in sub-section 5.5.2. Of these relationships, two are from training constraints (training design, and training policies); three dimensions are from learning environment constraints: (time management, curriculum level, and students' access and economic viability); and two dimensions from institutional level constraints: university policies, and network infrastructure and computer facilities.

5.5.1 **Dimensions having effects on user satisfaction**

Findings indicate that user satisfaction influences system usage. Three dimensions are linked to user satisfaction: two from drivers, and one from training constraints. Shown in Figure 5-12 as part of the drivers concept are the links from forefront of innovation and teaching performance. From training constraints, a link is shown from training needs.

5.5.1.1 Forefront of innovation has positive moderate effects on user satisfaction and system usage

Relating forefront of innovation to user satisfaction signifies that participants were motivated to use the system because they felt that they were keeping pace with technology. The use of MOLÉ had given 15 participants a sense of satisfaction because they felt they were updated with some technological developments. Although being at the forefront of innovation does not suggest that participants became efficient in their teaching, they shared that it made some of their teaching tasks easier. Participants commonly talked about the system as an innovative tool for their teaching and learning. They were happy using MOLÉ because of the convenience. Furthermore, they shared that with the tools of MOLÉ some tasks that were not possible in a traditional classroom can be efficiently done using the system. Being at the forefront of innovation motivated participants to use the LMS, and is associated to having a positive level of user satisfaction. This positive relationship is shown with a one-way arrow linking forefront of innovation to user satisfaction. Some of the coded references are presented in sections 4.2.5 and 5.1.

5.5.1.2 Teaching performance has positive moderate effects on user satisfaction and system usage

Also shown in Figure 5-12 is the relationship linking teaching performance from the drivers concept to user satisfaction. There were 16 participants whose coded references related to their experiences of using the tools of MOLÉ, which in effect have improved their teaching performance. Their use of the tools has contributed to their teaching efficiency. Some of the ordinary tasks in the traditional classroom had been eliminated, like providing copies of lecture notes to their students. The learning resource management tool made it easy for academics to keep their students informed of their lessons, and keept students ready for activities in the class. Likewise, class announcements, assessments, and giving feedback had haimproved because of the interaction and communication tools, and feedback and assessment tools. An improved teaching efficiency rating manifested an improved teaching performance for some participants. Overall, this study indicates that user satisfaction level of those who had constantly used MOLÉ is high. Section 4.2.4 presents some coded references about teaching performance. Likewise, section 5.1 largely covers several coded references related to the dimension on improved teaching performance.

5.5.1.3 Training needs have moderate negative effect on user satisfaction but a strong negative effects on system usage

Contrary to the positive effects of the two drivers' dimensions, training needs reduce a participant's user satisfaction, which substantially affects system usage. Ten participants expressed their lessened satisfaction to training needs but overall, there were 27 participants who had considerable comments about their system usage. Most participants had personally assessed themselves on two aspects: their attitude towards training, and their needs to upgrade or improve their skills. Some were not totally satisfied with what they were currently having because they were constrained by their deficiencies. For example, some academics wanted to use some tools and wanted to be trained to improve their skills. However, there were some issues that refrained them from being able to attend a training session. Some of the reasons were: existing training policies, schedule of training, and the level of training that they wanted to acquire. Most of the coded references are referred at section 5.3.1.1.

Other participants can get by without attending training because they can learn to use the tools by themselves. However, the challenge for these academics was the time they needed to self-train. Participants asserted that their personal constraints in this regard can be solved if they have a user manual, or an interactive training CD. However, there were no materials

available because the training team has not produced any of these. Although there were user instructions available, these were the help menu of Moodle which were available online. Hence, the assessed needs for training diminished user satisfaction to a certain extent because there were external factors affecting them which also tended to de-motivate them to further their skills and use of MOLÉ.

5.5.2 **Dimensions having effects on system usage**

In the sub-sections below, the effects of specific dimensions to system usage are analyzed. Similar to the preceding sub-sections, the degree of these effects – either moderate or strong is used.

5.5.2.1 Training Design have moderate negative effects on system usage

There were 16 participants whose coded references indicate that training design has affected them. Likewise, collected system logs show that usage of MOLÉ's interactive features is low. There are two sides of the story related to this. On one hand, participants who had attended basic training wanted to learn more. Accordingly, their system usage was minimal because they felt they needed to learn the advanced features, and as such they needed to have another training session for this level. On the other hand, there were participants who suggested that during training, only the basic information is necessary. The coded reference for this issue was quoted in section 4.4.2 by one of the participants.

Findings indicate that MICEL, as a training facility, needed to design different levels of the training coupled with an assessment form that will be used to analyze the training needs of academics who want to undergo training. The assessment form shall have important information that academics can assess themselves as to what specific training they will need.

5.5.2.2 Training Policieshave strong negative effects on system usage

Training policies affect system usage because of the issues on funds, and who can attend training. This came from 19 participants whose coded references and system logs indicate low usage. The most prominent among the issues about training policies relates to funding, such that training was charged against college funds. Many of these participants commented that training should be available to all interested academics. Another issue relates to output when training was completed. Some participants with administrative positions were mindful that training policies have to be firm in relation to what outputs the trainees have to produce to encourage academics to make good use of the training.

Results indicate that there were some participants whose training was not applied because their level of interest was low. Overall, the current training policies were considerable for some, but many participants felt that these policies needed to have better measures to maximize training outcomes. Most of the coded references for this dimension are mentioned in sections 4.4.3 and 5.3.1.2.

5.5.2.3 Time management have strong negative effects on system usage

Time management is an internal issue to most participants. The negative effects of time management on the system usage outcomes is strong, which was gathered from 19 participants. Time management has many related issues. These issues include preparation time for learning resource development, time to attend training, time to interact with students and give them feedback and assessments, among other tasks. Even connectivity problems became an issue that was related to time management because of the time it takes to download or upload files.

Findings indicate that time management issues are personal in nature. Most of the coded references are quoted in section 4.3.1. The solutions suggested by many participants were establishing university policy that recognizes the blended learning environment with MOLÉ, and the traditional face-to-face classes as complementary vehicles for instructional delivery.

5.5.2.4 Curriculum level constraints have strong negative effects on system usage

The issues on curriculum level have strong negative effects on system usage with 21 participants relating the problems on the courses they handled. Participants attributed the problems on the types of subject content, particularly on how it was different with descriptive courses from problem solving or mathematical subject contents. They argued that it is more appropriate to use MOLÉ for descriptive types of subject content. Another issue was related to what subjects have a computer laboratory component, which was then related to accessibility problems of their students. It was also an issue for many participants without computer laboratory components because they wanted to use the test or exams tools of MOLÉ to lessen the burden of checking or marking tests. Letting students take the test without their presence was not practiced by many academics because of the issues related to test validity and reliability.

Findings indicate that system usage outcomes are affected with the reasons above. Coded references can be referred at sections 4.3.2, 5.2.1.6 and 5.2.2.1. The major suggestion from many participants was to provide computer laboratories for each of the schools or colleges so

that academics can use the facilities not only when conducting major exams but also for some of their classes like for example, showing concepts and lessons on interactive video and the like.

5.5.2.5 Students' access and economic viabilityhave moderate negative effects on system usage

Participants' decision to use MOLÉ was affected by access issues of students. Thirteen participants related the issues on access to the economic status of the students. A large percentage of the student population in this university are poor, hence they cannot afford to buy their own computers. Participants shared that they cannot force their students to use MOLÉ because it would be unfair for others who cannot afford a computer. Likewise, participants were concerned about the safety and security of their students – should their students decide to work at Internet cafés to comply with their class requirements online. The coded references are mostly presented in sections 4.3.3 and 5.2.1.2.

Findings indicate that students' access issues and curriculum level constraints have similar solutions to the problem – that of providing computer laboratories to be able to cater to students who cannot buy their own computer, and for those who are economically challenged to spend every peso to access resources at Internet cafés.

5.5.2.6 Network infrastructure and computer facilitieshave strong negative effects on system usage

The coded references from 31 participants refer to the network infrastructure and computer facilities dimension, which this study found to be the strongest inhibitor to using MOLÉ. All these participants commented about connectivity issues which narrows down to this dimension. Most of them talked about the problems encountered in and out of the university campus. But the issue is not solely attributed to the care of the university. There are times that the internet service provider fails to provide the expected bandwidth resulting to slow connectivity. Most of the coded references related to this theme are referred in sections 4.5.2 and 5.4.11.

Another big issue that this study has found is specifically related to computer facilities. Participants from colleges that were not technology-based found it difficult to motivate their students because there were no available computer laboratories. Although there is considerable number of Wi-Fi hotspots on campus, generally, a low percentage of students had their own computers. However this issue is not just restricted to students. Academics

themselves were having problems because of the limited number of computers in their offices.

Findings indicate that the inter-relatedness of network infrastructure and computer facilities to the other constraints outline above are justified from participants of all academic disciplines.

5.5.2.7 University policies have strong negative effects on system usage

Issues referring to university policies were sourced from 29 participants. University policies in the context of this research encompass the issues that were discussed in learning environment and training constraints in sections 5.2 and 5.3 respectively. The inter-relatedness of all other issues that affected the participants is displayed with back-to-back arrows because system usage is believed to be dependent on existing university policies.

Two scenarios are exemplified. The first scenario is: if the use of MOLÉ remains voluntary, the attitude of academics towards the system is that of being complacent because he/she can just 'sit in their comfort zones' where he/she does not have to worry about how to use the system extensively. The second scenario is: if the use of MOLÉ is mandated, academics will complain about being coerced to use it, hence they will assert about their 'academic freedom'.

Both scenarios need to be considered regardless of what university policies are instituted in the context of system usage. Findings indicate that university policies have to be contained on implementing MOLÉ as a recognized complementary instructional delivery vehicle. However, given the constraints of MOLÉ, voluntary use could still prevail but issues and constraints need to be minimized in each of the concepts outlined above. A more comprehensive assessment of the critical issues related to teaching and learning in the blended mode have to be considered.

5.6 Chapter summary

A summary of findings is shown on Table 5-11.

Table 5-11: Summary of Findings

Categories influencing perceptions on dimensions of drivers and constraints
Academic discipline influences the perception of • Learning Resource Management tools (sec. 5.1.1.1) • Interaction and Communication tools (sec. 5.1.1.2)\ • Feedback and Assessment tools (sec 5.1.1.3) • Curriculum level constraints (sec. 5.2.1.1) • Students' access and economic viability (sec 5.2.1.2) • Students' work and validity of control (sec. 5.2.1.3) • Training needs (sec. 5.3.1.1) • Network infrastructure and computer facilities (sec. 5.4.1.1) **Academic position influences perception of** • Learning Resource Management tools (sec. 5.1.1.4) • Curriculum level constraints (sec. 5.2.1.4) • Students' access and economic viability (sec. 5.2.1.5) • Training policies (sec.5.3.1.2) • University policies (sec. 5.4..1.2) **Program level handled** influences the perception of • Feedback and Assessment tools (sec. 5.1.15) • Curriculum level constraints (sec. 5.2.1.6) **Training mode attended** influences the perception of • Interaction and Communication tools (sec. 5.1.1.6) • Training design (sec. 5.3.1.3)
Perceptions of dimensions that influence the extent of system use
• Interaction and Communication tools (sec. 5.1.2.1) • Curriculum level constraints (sec. 5.2.2.1) • Students' access and economic viability (sec. 5.2.2.2) • Training policies (sec. 5.3.2.1) • University policies (sec. 5.4.2.1) • Network infrastructure and computer facility (sec.5.4.2.2)
Effects of dimensions on outcomes
have positive moderate effects on personal satisfaction and system usage • **Forefront of innovation** (sec. 5.5.1.1) and • **Teaching performance** (sec. 5.5.1.2) have moderate negative effect on personal satisfaction but a strong negative effects on system usage • **Training needs** (sec. 5.5.1.3) have moderate negative effects on system usage • **Students' access and economic viability** (sec. 5.5.2.5) • **Training design** (sec. 5.5.2.1) have strong negative effects on system usage • **Time management** (sec. 5.5.2.3) • **Curriculum level constraints** (sec. 5.5.2.4) • **Training policies** (sec. 5.5.2.2 • **Network infrastructure and computer facilities** and **University policies** (sec. 5.5.2.6) • **University policies** (sec. 5.5.2.7)

This chapter presents a model of influences in usage of MOLE at MSU-IIT.

Findings from this study suggest that academic discipline has the biggest influence among the participants to use MOLÉ. However, reasons are varied. Even a participants' association to

his/her academic discipline cannot be singled-out to be a strong influence on voluntary use of MOLÉ. The study shows that subject content could drive academics to use the system. Other influencing categories are academic position, training attended, and program level handled.

Interaction and communication tools (I&C) are undoubtedly the most complex tool to use. Most participants were convinced that they needed to have further training that includes pedagogical techniques to be able to maximize the use of I&C tools; and training on how to effectively use the tools in MOLÉ for large classes.

The different constraints have been discussed, and inter-relationships are analyzed within every concept to elucidate the effects on outcomes. The effects of every constraint emanating from each of the concepts are varied.

The drivers concept's two dimensions (forefront of innovation and teaching performance) extend its output towards satisfaction, and these are linked to system usage. The moderate relationship from satisfaction to system usage suggests that the satisfaction from using MOLÉ, particularly being happy with the system features, and their behaviour towards the system were manifested in system usage. These two links have a positive influence on system usage.

Also, a link from the training needs dimension is connected to satisfaction. This moderate relationship from training needs suggests that there is a certain level of user satisfaction when academics are given the necessary training. However, further analysis showed that training needs are strongly related to system usage, which means training is necessary for them whatever satisfaction level they have towards MOLÉ.

A moderate relationship from training design is linked to system usage. This implies that when training needs are comprehensively assessed, it gives the training team the idea of what specific training should be designed for academics who need to undergo training. Expectedly, the effects of comprehensively designed and efficiently implemented training sessions could be manifested on the increase in the number of knowledgeable system users.

Two strong relationships are linked from learning environment constraints to system usage. These emanated from time management and curriculum dimensions. In relation to time management, per complaint of a number of academics, the issues on time made it challenging to use the system, which some academics equated to compensation, while others had preparation and development of learning resource issues. Regarding curriculum, the relationship is strong because several academics whose courses were not technology-based

found it challenging to use the system. This problem also related to the access issues of most economically challenged students although, the effects to the participants' system usage on the context of student problems is moderate. Another strong relationship is established from training constraints, i.e., training policies. Participants argued that training should be available to all academics who want to attend usage training and workshops.

Apart from training needs two more strong relationships exist, which come from institutional level constraints. This study has found that the most challenging issues are university policies; and network infrastructure and computer facilities. The general notion of participants was to establish university policies and necessary guidelines that will recognize MOLÉ as a complementary tool to teaching and learning. With university policies in place, participants believed that other issues integral to system usage could be minimized and could improve and sustain the voluntary system usage of these academics.

To firm up the context and analysis of this research, the next important step is to compare or enfold the findings to the relevant existing literature. This enfolding the literature step is presented in the next chapter.

CHAPTER 6

6 LITERATURE COMPARISON

In this chapter, the findings and analysis that were discussed in Chapters 4 and 5 are compared and contrasted with the existing literature. This pertinent process called enfolding literature (Eisenhardt, 1989), which was described in the methodology chapter (Chapter 3) is a crucial step in strengthening the theory that emerged in this study. Some components of this chapter and the analysis chapter formed the basis for the conclusion in the final chapter (Chapter 7).

The aim of this chapter is to provide a theoretical grounding for the theory generated in this research. The objective is to allow further analysis and synthesis of the generated theory from the perspectives of other research by looking at the similarities and differences, and the reasons for such occurrences. It will also highlight gaps in the literature and endeavours to contribute to the existing body of knowledge. Comparative analysis in this chapter is broken down into two themes: comparing literature with the study's findings, and theorizing voluntary LMS usage. Theoretical integration is discussed in the conclusion of this chapter.

6.1 Comparing the findings with literature

Comparisons are presented in the following two main sections: literature that discusses adoption and use are discussed in section 6.1.1, while environmental constrainsts are discussed in section 6.1.2

The findings from the various studies reviewed in chapter two are found to have similarities with the findings in this research. The similarities are discussed in the subsequent sections below. However, this research provides new findings that contribute to the understanding of voluntary system usage. For instance, this research investigated nine categories of the participants (refer to Table 5-2 in Chapter 5). Each of these categories has properties or attributes. Categories are groupings which facilitated the comparison within and between the concepts in this research. Of the nine categories, results show that there are four categories that influence perceptions of dimensions: (1) academic discipline, (2) academic position, (3) program level handled, and (4) training mode attended. No literature has been found to compare such categories. Studies that have been found to have similarity or no similarity to this research are outlined in Table 6-1.

Table 6-1 consolidates the effects of dimensions on outcomes depicting the concepts and dimensions that affect personal satisfaction and system usage. Columns of comparison are populated with studies that were reviewed from Chapter 2.

Table 6-1: Comparison of existing literature to the findings of thesis

Effects of dimensions on outcomes						
Concepts	Sec.	Dimensions	**Effects**	On outcomes	Comparison with some Literature	
					Similar	Not similar
Drivers	5.5.1.1	Forefront of innovation	**moderately positive**	personal satisfaction and system usage	Al-Busaidi & Al-Shihi (2012),	
	5.5.1.2	Teaching performance	**moderately positive**	personal satisfaction and system usage	Al-Busaidi & Al-Shihi (2012) Dias & Diniz (2012), Islam (2012), Yengin et al. (2011),Bolliger & Wasilik (2009) Harrington, Staffo, & Wright (2006), Bolliger andWasilik (2009), Lin,Singer, & Ha (2010),Lonn and Teasley (2009), Clark, Beer & Jones (2010);	
Training constraints	5.5.1.3	Training needs	**moderately negative**	personal satisfaction and system usage	Al-Busaidi and Al-Shihi (2012), Samarawickrema and Stacey (2007), Cuban, 2003, Thomas & Stratton, 2006	
Learning Environment constraints	5.5.2.5	Students' access and economic viability	**moderately negative**	system usage		Bolliger & Wasilik (2009)
Training constraints	5.5.2.1	Training design	**moderately negative**	system usage		Sridharan et al. (2011)
	5.5.1.3	Training needs	**strongly negative**	system usage	Sridharan et al. (201), Ocak (2011), Pauleen and Yoong (2004), Samarawickrema &Stacey (2007), Al-Busaidi& Al-Shihi (2012)	
Learning Environment constraints	5.5.2.3	Time management	**strongly negative**	system usage	Ocak (2011), Garrote & Pettersson (2007)	
	5.5.2.4	Curriculum level constraints	**strongly negative**	system usage	Harrington, Staffo & Wright (2006) Ocak (2011)	
Training constraints	5.5.2.2	Training policies	**strongly negative**	system usage		
Institutional level constraints	5.5.2.6	Network infrastructure and computer facilities	**strongly negative**	system usage	Selim's (2007)	Sridharan et al. (2011)
	5.5.2.7	University policies	**strongly negative**	system usage	Al-Busaidi & Al-Shihi (2012) Bolliger & Wasilik (2009) Wang & Wang (2009), Gautreau (2011), Ocak (2011), Macharia & Nyakwende (2010), Lin et al. (2010), Samarawickrema and Stacey (2007), , Nanayakkara (2007), Singer, & Ha 2010, Garrote & Petterson (2007);	Macharia &Nyakwende (2010)

6.1.1 **Adoption and use**

Many of the studies have indicated that system usage is focussed on the adoption of the LMS. Nevertheless, these studies have some similarities in some of their constructs, particularly on satisfaction, which was compared with the dimensions in this research.

6.1.1.1 Personal satisfaction

Results of this study signify that personal satisfaction encourages academics to use the LMS. Usefulness of LMS tools on teaching performance has moderate positive effects on personal satisfaction, which enhances system usage. Motivated by some factors like convenience, savings on printing cost, and innovative teaching strategies, academics in this study have moderate positive response to the use of the LMS. Likewise, being at the forefront of innovation gives academics a sense of being in pace with new trends and this sense add to their personal satisfaction. These dimensions' outcomes were discussed in sections 5.5.1.1 for forefront of innovation, and 5.5.1.2 on teaching performance.

There are slight similarities of the findings in this research with some of the reviewed literature. Some studies that exemplified user satisfaction include Al-Busaidi and Al-Shihi (2012); Bolliger and Wasilik (2009); and Yengin, Karahoca and Karahoca (2011). Notably, the study of Al-Busaidi and Al-Shihi (2012) illuminated the value of course management tools among academics. Al-Busaidi and Al-Shihi (2012) put forward three major characteristics (individual, the LMS, and organizational) that are related to satisfaction when intending to use the LMS. Moreover, statistical results indicated that computer anxiety, personal innovativeness, system quality, information quality, management support, incentives policy and training are key factors to instructors' satisfaction of LMS in blended learning (Al-Busaidi & Al-Shihi, 2012). They also asserted that instructors' satisfaction is a significant determinant of their continuous intention to use LMS in blended learning, and their intention to purely use LMS for distance education.

The findings of Al-Busaidi and Al-Shihi (2012) are similar to this research's findings wherein the three major characteristics are found to affect academics' system usage. Information quality, however, was not considered in this thesis. Management support, incentives policy, and training are the three components of organizational characteristics found in Al-Busaidi and Al-Shihi (2012) study that had an impact on instructor's satisfaction. Organizational characteristics are linked to the instructor's continuous intention to use LMS

in blended learning and intention to use LMS for pure distance education (Al-Busaidi & Al-Shihi, 2012).

Islam (2012) examined the role of perceived system quality as motivation to continue e-learning system use among educators. Results of the Islam (2012) study revealed that perceived usefulness, confirmation of initial expectations, and perceived system quality significantly affected educators' satisfaction. Likewise, results indicated that perceived usefulness and satisfaction significantly affected continuance intention. However, the study showed that there was no direct association between perceived system quality and continuance intention. In conclusion, Islam (2012) acknowledged that usage behavior is dynamic and changes over time due to changes in cognition as the users become experienced with the target system. Yengin et al. (2011) studied e-learning success model for instructors' satisfactions in the perspective of interaction and usability outcomes. Factors related to instructors' satisfaction in e-learning systems have been identified to social, intellectual and technical interactions of instructors in whole e-learning system.

The similarity of Islam (2012) and Yengin et al. (2011) to the thesis findings is on system quality and technical interactions. System quality is equated in this thesis as the capability of the LMS to assist academics in delivering class intstructions. In this current study it is found that some academics find it challenging to work with some of the tools in LMS. Thus, academics expressed their desire to be trained to upgrade their skills.

Bolliger and Wasilik (2009) examined the factors influencing faculty satisfaction. Results of their study confirmed that there are three factors affecting satisfaction of faculty in an online environment: student-related, instructor-related, and institution-related factors. The results in Bolliger and Wasilik (2009) imply that there are constraints that affect the level of satisfaction. Likewise, these constraints are found to exist in the findings of this research affecting academics' system usage: learning environment, training, and institutional level. Instructor and institution-related of Bolliger and Wasilik (2009) have similar effects on personal satisfaction. Results of their study suggest that instructors are affected with difficulties on the reliability of technologies, and conform that they needed to be more creative to teach online. This result is similar to this thesis in terms of the difficulty or challenges experienced with technology and learning resource preparation. Institution-related issues are found to be important to online faculty.Their results show that workload, compensation, preparation, and course evaluations affect their satisfaction and motivation

which are similar to the findings in this thesis. These issues are components of institutional policies dimension in this thesis.

Lonn and Teasley (2009) explored the uses and perceived benefits of using the LMS to support traditional classroom, as reported by students and academics. Findings from their study suggested that instructors and students value tools and activities from efficient communication more than interactive tools for innovating existing practices. Results also showed that survey item analysis revealed that instructors and students also highly value the teaching and learning tools within the LMS. The findings of Lonn and Teasley are similar to this thesis' findings in terms of academics' positive response on interactive and communication tools. Academics value these tools because their classes can be extended outside the classroom when necessary. Furthermore, students become more interactive and participative among each other, which enhance class discussion.

Satisfaction can be manifested through perceived ease of use and adoption, like in the studies of Wang and Wang (2009) and Selim (2007). Although the theme in Wang and Wang (2009) is not personal satisfaction, perceived ease of use can be similarly themed to satisfaction. In Wang and Wang (2009), system quality, service quality, and self-efficacy are found to increase perceived ease of use, where service quality contributes more to perceived ease of use compared to the other two variables. The authors argued the importance of effective and timely support to assist instructors in using web-based learning systems. They claimed that system quality, which can be measured by factors including the design of user interface and the usefulness of the functions provided, may influence perceived ease of use. Likewise, themes like adoption can be a manifestation of satisfaction. For example, the results of Selim's (2007) study revealed eight categories of e-learning critical success factors: instructor characteristics (attitude towards and control of the technology, and teaching style), student characteristics (computer competency, interactive collaboration, and e-learning course content and design), technology (ease of access and infrastructure), and support. Selim (2007) concluded that the eight critical success factor (CSF) categories impact the decision to adopt e-learning technology in higher education institutions. Compared with the findings in Wang and Wang (2009), this thesis did not consider to measure service and system quality quantitatively. However, from qualitative results the following are found to be equivalent: system quality is equated to the features of LMS allowing the user to utilize the system and keeps routinary teaching tasks easier. Service quality is compared to institutional level support, and self-efficacy is compared to confidence level on exercising technical and

pedagogical skills. Qualitative result from this thesis is similar in some aspects where academics need to be assured of timely assistance from support staff.

The difference of the results from Bolliger and Wasilik (2009) is that, results of their study were gathered from survey which is a self-reporting form of data collection. The context of students as affecting instructors' satisfaction differs from this thesis based on the instructors' perception that their online students are actively involved in their learning activities, participate at a good level, and communicate actively with the course instructors. In comparison to this thesis in which academics were interviewed and interaction with their students were recorded, the assessments made by MSU-IIT academics were verified why the logs recorded were low. Results from this thesis suggest that students' involvement was minimal, and the dissatisfaction of academics from students' participation was low because students were economically challenged, and access to facilities was not guaranteed. Furthermore, in this thesis, personal satisfaction was a moderating dimension to system usage, which means in some aspects (refer to Figure 5-12), it was personal satisfaction that drived system usage.

Most of these studies indicate that satisfaction is influenced by factors which are similar to the findings in this thesis. Factors that affect or influence satisfaction include the capability of the features of the LMS, such as the capability to manage learning resources, interaction and communication, and assessment tools. These are depicted on Table 6-1. Similar factors were also related to institutional policies. Overall, it is presumed that personal satisfaction influences system usage, however, the effect level varies in each individual.

6.1.1.2 Attitudes and personal characteristics

Findings in this research indicate that the attitude of academics towards LMS is dependent on their motivation and their acceptance or openness to use the technology. These notions are similar to what Dias and Diniz (2012) had investigated wherein they looked into the use of the LMS' tools of academics, focussing on what orientation these academics have. Results of their study illustrated the importance of the four profiles of teachers, namely: activities-oriented, interaction-oriented, assessment-oriented, and collaboration-oriented. Collaborative assessments of learning were articulated in the article of Strijbos (2011) giving insights on the perspectives of what could be assessed in learning.

Garrote and Pettersson (2007) examined lecturers' attitudes towards LMS, with particular reference to identifying obstacles to increased use. It was found that when lecturers decide

individually to use tools in the LMS, the major concern is the initial amount of work compared with the expected benefits. Interestingly, similar to the context of time management in this thesis, the amount of time to attend training, prepare materials, and interact or manage discussions online, the Garrote and Petterson (2007) study indicates also that academics equate their time and effort to their salary received.

A similar context on the relation between salary and the amount of time and effort exerted was found in the study of Gautreau (2011). Gautreau (2011), however, investigated the motivation factors of faculty use. Results pertaining to motivating factors were ranked from first to last, as follows: (1) salary, (2) responsibility, (3) achievement, (4) advancement, (5) company policy/administration, (6) work itself, and (7) recognition. In addition to salary, the other aforementioned factors in Gautreau (2011) have similarity to the dimension of institutional policies found in this research.

On the other hand, McGill & Klobas (2009) examined the role of task–technology fit in LMS success and addressed the question of how task–technology fit influenced the student performance impacts of LMSs. Results of the study showed that task–technology fit has a significant positive effect on the attitude towards LMS use. Shea, Pickett & Pelz (2004) conducted an extensive investigation of teaching presence and online learning. Using factor and regression analysis, it was found that students' recognition of effective "directed facilitation" (p. 182) and effective instructional design and organization on the part of their teacher contribute to their sense of shared purpose, trust, connectedness, and learning.

Relating the findings of their study to this thesis, it is surmised that individual judgement or attitude towards the LMS, and personal characteristics of individuals are similar. The idea that initial amount of work compared with the expected benefits, salary, responsibility and advancement are some of the major concerns of academics in this thesis.

6.1.2 **Environmental constraints**

Environmental constraints – the collective name used in this research stands for the three constraints: training, learning environment, and institutional level. Some studies and their relation to this research are discussed below:

6.1.2.1 Training

Training is one of the key factors for instructor's satisfaction in Al-Busaidi, and Al-Shihi (2012). It was noted that training in their study was referred to as training seminars,

workshops, and manual on the use of e-learning tools. Satisfaction, on the other hand, is linked to academics' continuous intention to use the LMS and intention to use the LMS for pure distance education (Al-Busaidi, and Al-Shihi, 2012). Their study did not go beyond investigating if there are other issues related to training, such as needs, design, policies, and services. Likewise, training need is one of the issues that emerged in the study of Harrington, Staffo, and Wright (2006). Their study was "hardly an exhaustive exploration" (p 186), thus, they recognized the need for further research in this area. In addition, since it was difficult to make generalizations from the interviews made with their seven participants, they recommended repeating and expanding similar studies. One of their recommendations was to investigate whether faculties in different disciplines use LMS differently, and whether attitude towards LMS are different among varied disciplines. Their findings are similar to this thesis in terms of training. However, academics' discipline as one of the categories in the study of Harrington et al (2006) was found in their study to be a potential area of research.

Online interaction, communication, and facilitation are three of the major hurdles that academics experience. The study of Pauleen andYoong (2004) has attested to these hurdles. Results in their study indicated that learning to facilitate electronic meetings is a complex and difficult experience. The research process that Pauleen and Yoong (2004) had applied enabled them to ascertain the importance of training to enhance the skills for interaction and communication online. A similar finding is indicated in the Samarawickrema and Stacey (2007) study. Findings in Samarawickrema and Stacey (2007) study found the importance of training and professional development on using a course management system. Their study demonstrated that timely training in different areas and readiness of the staffs to be trained are necessary. Appropriateness, applicability, timeliness, and relevance of professional development are indicators of worthiness for the staff. A major barrier to academics' adoption of information technologies is the academics' lack of knowledge and ability to integrate the technologies into their teaching practices (Cuban, 2003 and Thomas & Stratton, 2006). Both studies have found that a major barrier to academics' adoption of information technologies is academics' lack of knowledge and ability to integrate the technologies into their teaching practices. Compared to this thesis, the findings are similar, such that facilitating during online interaction between academics and their students is a challenge.

Sustainability is one indicator that the LMS is a useful system and its implementation is a success. But to sustain usage is a challenge, especially if there are barriers to its effective adoption. Findings of the study of Sridharan, Deng, and Corbitt (2010), which evaluated the

critical success factors for sustainable e-learning in an e-learning ecosystem framework, indicated that there are several barriers to an effective adoption of the proposed e-learning success model for improving the effectiveness of elearning. These barriers include a lack of understanding of the technologies behind various pedagogies, insufficiencies of the popular learning management systems, and the sustainability of the learning objects repositories. The lack of understanding of the technologies behind various pedagogies offers a little similarity to one of the findings in this thesis. Academics in this research have indicated that training is needed for them to acquire the necessary pedagogical skills and enhance their skills in using LMS tools. However, the apparent insufficiencies of the popular LMSs have not been investigated in this thesis as what Sridharan et al. (2010) has done which makes this thesis outcome dissimilar to theirs. The sustainiability of learning object repositories are not as well investigated in this thesis.

In summary of the training components of other thesis, their findings are similar to the issues found in this thesis especially in getting the right amount of training. Facilitating a large number of students is a challenge for many, which is similar to the studies reviewed. The design of training which this thesis has found is an issue for academics, which other studies above had mentioned. More importantly, the similarities do not end there. This thesis has very similar findings to the studies which mention about appropriateness, applicability, timeliness, and relevance of professional development. The lack of knowledge and ability to integrate the technologies into their teaching practices are the challenges of this thesis' findings which is similar to others' findings wherein a major barrier to academics' adoption of information technologies is the academics' lack of skills, thus they needed training, including pedagogical skills in handling their classes online.

6.1.2.2 Learning environment

The curriculum level dimension of this thesis is similar to the findings of Harrington, Staffo, and Wright (2006). They conducted a study on the faculty use and attitudes towards a course management system (CMS) in improving instruction. Results showed that five overarching categories emerged from the analyses, namely: motivations, benefits, perspectives, differences in course formats, and issues and needs. On the other hand, Ocak (2011) conducted an exploratory, qualitative case study which examined the problems and impediments that faculty members encountered in blended learning environments in a Turkish Higher Education system. The results demonstrated that faculty members' problems with blended teaching resulted in the identification of three inductive categories: instructional

processes, community concerns and technical issues. There were eight themes that emerged from these three categories. The themes include the following: (1) complexity of the instruction, (2) lack of planning and organization, (3) lack of effective communication, (4) need for more time, (5) lack of institutional support, (6) changing roles, (7) difficulty of adoption to new technologies and (8) lack of electronic means. In the study of Ocak (2011), the eight themes are compared to the learning environment and institutional level constraints in this thesis, which are curriculum constraints, being compared to instructional processes.belonging to the learning environment concept in this thesis. Technical and community issues are being compared to institutional level constraints in this thesis.

Studies about students' use were reported by Lee (2006). This study is not similar to the context of students' access and economic viability that this thesis has found. In Lee (2006) study, an investigation of the factors affecting the adoption of e-Learning systems (ELS) by students in mandatory and voluntary settings was carried out. The results implied that mandatory usage is necessary for overall adoption of the ELS among students.

The problems mentioned in the studies of Harrington, et al. (2006) and Ocak (2011) are related to the learning environment constraints in this research findings. Overall, both studies are also challenged with the support of their institutions, similar to this study, which also redounds to academics' motivation to adopt or use the LMS. Conversely, while the context of the study of Lee (2006) is on students, the notion that mandated usage may instill overall adoption of the system among students, this thesis has also gathered among a few academics suggesting about mandatory use. But these findings do not affect the ideas of voluntary usage in this thesis. For some academics in this thesis, academic freedom is felt by some - as being curtailed if mandatory use becomes a policy of the university.

6.1.2.3 Institutional

For Samarawickrema and Stacey (2007) they stated that academics' adoption of the LMS has been found to have relations to politics and institutional issues. Many of the reasons for teaching academics' adoption were not just related to improving learning, but were stimulated by the politics of the context, such as top-down authority directives, funding grants, and faculty politics. "Institutional context and procedures, faculty or department climate and ethos, and initiatives and incentives aimed at improving productivity played a commanding role in adoption decisions" (Samarawickrema & Stacey, 2007, p. 330). In comparison to this thesis, politics is felt similarly, but more specific to training policies that

has been passed, where the funding for training is limited, such that academics were affected of getting the right amount of training for LMS use.

Lin, Singer, and Ha (2010) investigated university members' use of and resistance to a communication information technology system (Blackboard) in a higher education organization. The case study found that the following structures were enacted in organizational members' interactions with the system: maximum use, enhancing teaching, augmenting service, limited use, and resistance. The researchers emphasized that besides providing empirical evidence to the enactments of inertia, application, and change, their case study added a new enactment type, i.e., resistance, to the existing enactment typology. The similarity of Lin et al. (2010) to this thesis is in the context of enhancing teaching. In this thesis, academics appreciate the use of LMS since it is useful and complements their traditional face-to-face lessons.

Results from the study of Macharia and Nyakwende (2010) indicated that the characteristics of Vice Chancellors/Chief Executive Officer (CEO) are important determinants of LMS adoption and diffusion by instructors in higher education. These characteristics include: keenness on modern information communication and technologies (ICTs), influence on ICTs development, and visionary ICT leadership. Results also showed that organizational variables of subjective norm, availability of ICTs, organizational support, organizational readiness, and top management support were related to behavioural intentions to use LMS by academic staff for teaching and learning. Furthermore, results suggested that top management support was found as the dominant factor in predicting the acceptance of LMS. Although the current thesis is similar to Macharia and Nyakwende (2010) through the inclusion of Vice Chancellors, no dominant factor was figured out in this thesis. It has to be noted that vision statements and characteristics of these leaders were not considered in this thesis because academics who have high administrative positions have the same questions being answered during the interview. There was no distinction and separate treatment that were applied during the interviews in this thesis. Except that, the high ranking academics and all other academics with administrative function in this thesis were only categorized of their responses during the coding of their interviews.

In Nanayakkara (2007), results of the study revealed that there are three key groups of factors that affect the adoption of e-learning systems: individual, system and organizational. In addition, results illustrated that while individual factors have significant contribution to the LMS adoption, the system and organizational factors are the most crucial determinants for

user acceptance in e-learning systems. In particular, the participants ranked the following as the five most essential factors for staff uptake in e-learning systems: release time for staff, ease of use of LMS, perceived usefulness of LMS, training and support to develop online content, and reliability of information and communication technology infrastructure. All these factors have been found to be similar to this thesis' findings, except for the expected outcome, which is the voluntary LMS usage specified in this thesis. In contrast, most studies conducted with regard to LMS are to determine its acceptance.

Overall, findings in this thesis suggest that the institutional level constraint is the dominant constraint that affects academics' LMS usage at this stage, which is similar to the findings of others. The only difference which was already explained above is Macharia and Nyakwende (2010), because they have different variables, which are, the characterisics of Vice Chancellors.

6.2 Theorizing voluntary LMS usage

Findings that theorize voluntary system usage have not been found in any of the studies on system usage thus far. According to Burton-Jones and Straub's (2006), theorizing system usage uses a two-staged approach: defining and selecting usage measure. In measuring system usage, it is necessary to investigate actual use. Some studies did measure the actual usage of the systems.

6.2.1 **Actual use**

Clark, Beer and Jones (2010) conducted an exploratory case study using a data mining technique to analyze academics' and students' involvement with the LMS, and the links between the LMS, the academic, and the students. Results showed that academics were focussed more on content than in creating opportunities for discussion and community. The researchers also examined the data to find out what was occurring in a single academic's course sites in terms of content, forums, hit counts, and grade. Overall, the study posited that an academic's approach to their understanding of teaching is allied with the feature adoption within the LMS. Furthermore, the study has shown that using the data logs from the LMS server can verify the involvement of both the academic and the students. The findings in this thesis are similar to Clark et al. (2010) study. Log data of academics have prominent non-interactive activities in this thesis which signify that they are mostly concerned with using the feature of LMS to manage and distribute files. Data mining is an innovative way of analyzing

actual usage. An article that samples how data mining is done in the education context is explained in the study of Romero et al., 2008.

On the other hand, Posea, Mihaila, Trausan-Matu, Cristea, and Gartner (2006) conducted a study to develop an evaluation method for e-learning platforms. Actual usage was based on the analysis of time and frequency aspects and logs, and on visualization of social networks. The study showed that, in the case of Moodle, the forum collaborative tools were available to students, but their use was not mandatory or even rewarded. Based on the log data, the very small number of posts per user and especially the number of replies showed that the students preferred alternative communication channels. Results further demonstrated that the average length of the posts signified that the replies given were rich in content. For evaluating collaborative using visualization techniques, the researchers contended that network interaction signified that the teachers communicated well with the students. But it also showed that there were no strong teams in the group of students because the network is centralized around the teacher. Compared with this thesis, the interaction between students and academics is low which indicates that the interactive feature of the LMS which this thesis calls interaction and communication tools is not largely explored. There are just a few academics that use this interaction and communication tools. Same as comented above, academics in this thesis use the LMS as a learning resource manager, i.e, to distribute learning resources to their students. By this, academics expressed that they save on printing costs.

Although the above studies are similar to this research on the context of using computer logs, the difference lies on the parameters being measured. The former two studies looked into how their participants use the features or tools of the system, whereas this thesis examined voluntary use.

6.2.2 **Voluntary usage**

There are two studies that have contrasting results in a voluntary usage situation. On one hand, Staples and Seddon (2004) tested the technology-to-performance chain model (TPC), where research on task-technology fit and user attitudes were combined to predict performance in two settings: mandatory use and voluntary use. Results of the study showed that social norms have significant impact on utilization in the mandatory use setting. On the other hand, van Raaij and Schepers (2008) where the use of LMS was mandatory; they found that social norms had no effect on use of a LMS. Participants in this study were MBA

students who had been using the LMS extensively for 3 months. The context of voluntary use is the only similarity of these studies to this research. In this research, social norms were not found to affect the usage of academics. However, results show that academics, who are regular users of the LMS and have already gained some skills, do share their knowledge of use with their colleagues in their departments. For example, enthusiastic academics in a department schedule a training session for their colleagues in the department. This is an opportunity for the enthusiastic users to hone their skills at the same time teach their colleagues.

6.2.3 **Measures of system usage**

The 'very rich' measure of Burton-Jones and Straub (2006) is very useful in the study of system usage. The three elements – system, user, and tasks were initially considered during the analysis of this thesis. However, another level beyond what was proposed in Burton-Jones and Straub (2006) context came out in this investigation of voluntary usage. But there was not enough information to measure the fourth element that used qualitative procedure. Hence, this research argues that it is pertinent to extend the level of measurement for LMS usage. The seventh level therefore is proposed, which this thesis calls, is 'extra rich', and described as: the extent and way to which the user employs the system to carry out tasks given the environmental conditions that the user is situated.

Interestingly, it is the study of Suwannakoot, Sarkar, and Dick (2011) that was found to be closest to this thesis with regard to the fourth element. Suwannakoot et al. (2011) argued that there are four elements in the richness measure, which is comprised of: system, user, task, and context. The richness of measure is called 'very very rich' in their study Suwannakoot et al. (2011). In contrast, the measurement type is called 'extra rich' in this research. Moreover, the elements are comprised of system, user, task, and environment. It is not however voluntary system usage which is being measured in Suwannakoot et al. 2011.

Table 6-2 depicts the richness measure. The first six measures are reproduced from Burton-Jones and Straub (2006).

Table 6-2: Richness of measures of system usage

(Note: Measures from #1 to #6 are adapted from Burton-Jones & Straub, 2006)

<table>
<tr><th rowspan="2">Richness of measures</th><th rowspan="2">Type</th><th colspan="3">Domain of content measured</th><th rowspan="2">Lit. examples from Burton-Jones & Straub, 2006</th></tr>
<tr><th colspan="3">Usage</th></tr>
<tr><td>1. Very Lean</td><td>Presence of use</td><td></td><td></td><td></td><td>Alavi and Henderson (1981)</td></tr>
<tr><td>2. Lean</td><td>Extent of use (omnibus)</td><td></td><td></td><td></td><td>Venkatesh and Davis (2000)</td></tr>
<tr><td>3. Somewhat Rich (IS)</td><td>Extent to which the system is used</td><td>System</td><td>User</td><td>Task</td><td>Saga and Zmud (1994)</td></tr>
<tr><td>4. Rich (IS, User)</td><td>Extent to which the user system employs the system</td><td>System</td><td>User</td><td>Task</td><td>Agarwal and Karahana</td></tr>
<tr><td>5. Rich (IS, Task)</td><td>Extent to which the system is used to carry out the task</td><td>System</td><td>User</td><td>Task</td><td>Igbaria et al. (1997)</td></tr>
<tr><td>6. Very Rich (IS, User, Task)</td><td>Extent to which the user employs the system to carry out the task</td><td>System</td><td>User</td><td>Task</td><td>Burton-Jones & Straub (2006)</td></tr>
<tr><td colspan="5">Proposed measurement type</td><td>Lit. examples on voluntary usage of LMS</td></tr>
<tr><td>7. Extra Rich (IS, User, Task, Environment)</td><td>Extent and way to which the user employs the system to carry out tasks given the environmental conditions that the user is situated</td><td>System</td><td>User</td><td>Task</td><td>none</td></tr>
<tr><td colspan="4">Environment</td></tr>
</table>

6.3 Chapter summary

This chapter has integrated the findings from the existing literature and those that are found in this study. The findings that were compared strengthened the proposed definition of voluntary system usage in the context of blended learning. Notably, this study has added another level to the ‘very-rich measure’ of the triad of IS, user, and task, which is in adherence to the suggestion of Burton-Jones and Strauss (2006). Voluntary system usage in a blended learning environment is influenced by drivers and constraints to which academics (and students) are situated. Thus, the proposed voluntary system usage definition is:

> An activity that involves four elements: the individual using the system, the system being used, (i.e., the LMS), the task of teaching in a blended mode, and the environmental context of the academic. Voluntary system usage is the individual's interaction with the features of the system in his own volition to accomplish the tasks at hand.

Justified by the findings of this research, the theory of voluntary system usage particular to a blended learning environment is enumerated in Table 5-11 in Chapter 5. There are three perspectives that have been identified: (1) categories influencing perceptions; (2) perceptions influencing the extent of use; and (3) effects of the dimensions on voluntary usage.

The most significant influence on voluntary usage of the LMS is academic discipline. Other significant categories are: academic position, program level handled, and training mode attended. Extent of system use is influenced by the perceptions about external (extrinsic) dimensions, at which the dimensions of institutional level are the most prominent. There are positive and negative effects on system usage caused by internal and external constraints (refer to Figure 5-12).

Based on the two models (DeLone & McLean, 2003 and Vankatesh et al., 2003) presented in Chapter 2, there are themes that are relevant to this study. In the DeLone and McLean (2003) study, user satisfaction is shown as antecedent to system usage, which is confirmed in this research. However, voluntary system usage was not evaluated in their model. Similarly, in Venkatesh et al. (2003), voluntary usage was not specifically assessed; instead, voluntariness of use is a moderator to behavioural intention in consonance with social influence. Notably, in relation to blended learning environment, no literature has been found that proposed to look into voluntary system usage. Thus, this gap is addressed in this thesis.

CHAPTER 7

7 CONCLUSION

This chapter provides the conclusions of this research. The theories that emerged from the analysis of interview and log data in Chapter 5 and the related findings in Chapter 6 are summarized in this chapter.

7.1 Addressing the research question

This research investigated the voluntary usage of a learning management system in a blended learning environment used in Mindanao State University-Iligan Institute of Technology (MSU-IIT). The study utilized the following processes:

- literature review
- in-depth interview
- log analysis, and
- personal experiences

These processes that were carried out to examine how academics use the learning management system in MSU-IIT have provided a solid groundwork for the proposed model of voluntary system usage presented in this study.

This study has addressed the question:

> ***How do academics use the Learning Management System in a voluntary usage context?***

Three subsidiary questions linked to the main question have been subsequently answered. These are:

> *What enhances academic usage of a Learning Management System?*
>
> *What inhibits academic usage of a Learning Management System?*
>
> *What measures are necessary to increase and/or improve the usage of a Learning Management System?*

Enhancing academics' voluntary usage means increasing the number of satisfied and well-trained actively using individuals. Improving usage is more interactive usage as opposed to

simple content delivery. The best way to attain the status of an improved number should not only be manifested by the frequency of use by academics and their students, but also by the quality of teaching and learning that happens during the interaction process. Two perspectives are important in this case: looking at the internal (intrinsic) and external (extrinsic) aspects that affect voluntary system usage. Shown in Figure 7-1 is the basic structure of the concepts and their dimensions that emerged in this thesis which was shown in Chapter Four and Chapter Five.

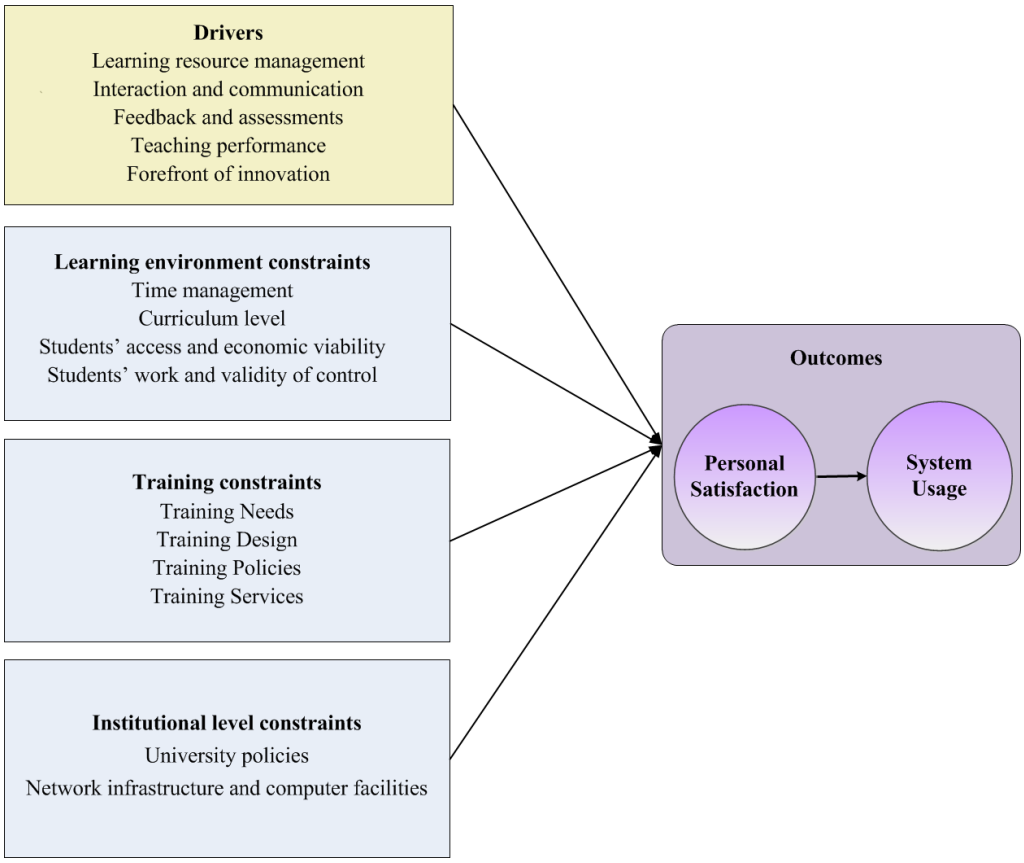

Figure 7-1: Concepts and its dimensions

Firstly, on the internal aspect, this study has examined the factors that motivate academics to use LMS. It has confirmed that when academics have an open or accepting attitude towards LMS, they make plans and devise strategies for their classes to maximize the use of the system.

This research has demonstrated that the level of personal satisfaction motivates academics to voluntarily use the LMS. Personal satisfaction is manifested in different ways such as the

conveniences they experience with LMS tools (these are: learning resource management, interaction and communication, and feedback and assessments); savings on printing costs; and improved teaching strategies, among others. Academics believed that teaching tasks can be accomplished more conveniently using the features or tools of the system. The tools allow them to manage their learning resources, interact and communicate with their students, and give timely feedback and assessments. An LMS-driven resource management has the advantage of portability, i.e., moving around references, and hyperlinking them. Furthermore, being at the forefront of innovation gives academics a 'sense of pride', but they affirmed that they have to put extra effort to learn how to use and keep up with technological developments. More importantly, academics recognized that their teaching performance has improved with the aspirations to apply pedagogical techniques even better through training.

This research also has illustrated that the degree of motivation to use is influenced by personal dispositions such as their own assessments of their lack of pedagogical and technical skills. With a positive attitude, even if they lack the necessary skills, they are more willing to learn.

Secondly, the external (extrinsic) aspects compromise the academics' usage at a certain degree. In this thesis, external aspects are represented by the concepts and their dimensions, which are: (1) learning environment constraints, (2) training constraints, and (2) institutional level constraints. The prominent issue in the learning environment perspective relates to the subject discipline – descriptive subjects are better delivered online compared to problem-solving or computational subjects. Findings of this research suggest that the cliche 'one-size fits all' cannot be adhered to. This notion of what subject discipline can be appropriately delivered in a blended learning environment has to be solved on the department or college level.

The issue on training is significant among academics because of their lack of pedagogical skills, i.e., how to manage the interactions that occur in the blended classroom. Academics have affirmed that they needed training at a certain level. While training could be an immediate solution, they strongly support the idea that equitable policy on training implementation, which considers design for specific audience and levels of skills, must be adhered to. For academics, their level of satisfaction may increase positively when they could be given the right amount of training.

This research has shown that most of the issues that emerged are largely related to institutional level constraints. Thus, if the issues are minimized or solutions are established, challenges on the learning environment and training constraints are also minimized, thereby enhancing academics usage of the LMS. By and large, academics are affected by the current condition about accessibility, connectivity, and compensation schemes. These issues are highly solvable on the executive management level. It is therefore suggested that the voluntary LMS usage model being proposed in this thesis be further evaluated and assessed of its applicability to the university, particularly, at MSU-IIT.

More specifically, this study proposes to the executive management of MSU-IIT the following:

- A rigorous review and implementation of the model and its re-evaluation when changes or improvements have been made, in conjunction with the university's monitoring, evaluation and learning system (MELS).
- Continuous assessment of the applicability and transportability of the model.
- Tightening the quality control for all on-going training programs and training courses university-wide.

7.2 Contributions

This research has made important contributions to the theory, analysis, and understanding of voluntary use of learning management systems in blended learning environments. These contributions are divided into practical and theoretical research implications and are discussed below.

7.2.1 **Practical implications**

This study has proposed a framework that highlights necessary measures to increase or improve the voluntary use of the LMS. It is important to consider that academics' use of the LMS largely rely on the conditions they are in. Academics' voluntary use of the system can be influenced by the socio-technological landscape of the learning environment. More importantly, the study has verified that academic disciplines have crucial influences to the voluntary usage of LMS. This research has found that there are varied approaches for each course, and more specifically, on subject content that can best fit a blended delivery of instructions. Extending further studies in this context will benefit this area of research.

The model that has emerged from this study (refer to Table 5-11 or Figure 5-12 as shown in Chapter Five for more details) may guide academics and administrators on minimizing constraints in their own environments to possibly enhance system usage. On a larger scope, universities that have similar environmental conditions in terms of institutional policies and economic viability of students may benefit from the suggested model. Institutional policies are mechanisms that recognize the relevance of LMS usage in organizations (i.e., on the executive management level); thus, network and infrastructure, as well as technology support can be facilitated. This recognition extends to students getting access and reliable network system which redounds to academics' motivation to use the LMS in blended environments.

7.2.2 **Theoretical and research implications**

This thesis has presented a methodology for abstracting the relationships of drivers and constraints. The qualitative interviews are matter-of-fact accounts of what academics felt about the learning management system, and their aspirations for having a useful and beneficial tool for teaching and learning with technologies. Analysis of computer logs has furthered the understanding of the academics' claims about their usage of the system. This research has made contributions to:

- the theory that: voluntary system usage in a blended learning environment is influenced by drivers and constraints of the situation the users are in. The model presented in Figure 5-12 in Section 5.5 shows the drivers and constraints of academics reflecting voluntary usage outcomes. The model visually explains the positive and negative factors that influence the perceptions of use of the LMS;
- the usefulness of an extension of Burton-Jones and Straub's (2006) measure of system usage (refer to #7 of Table 6-2);
- a contribution to the definition of system usage in the context of voluntary use of learning management systems. Voluntary system usage is thus defined as: an activity that involves four elements: the individual using the system, the system being used, i.e., the LMS, the task of teaching in a blended mode, and the environmental context of the academic. Voluntary system usage is the individual's interaction with the features of the system in his own volition to accomplish the tasks at hand.

7.3 Limitations of the Research

This research has a variety of limitations that have been considered when adopting the generated theory. These are:

- The generated theory was based on the perspectives of academics in one state university, the Mindanao State University –Iligan Institute of Technology in a developing country. An original intention behind this research was to enhance the LMS use in MSU-IIT through practical and theoretical solutions. Meanwhile, the perspectives of differently situated academics in affluent or more developed environments were not considered in this study
- There were only thirty-three academics interviewed. Although theoretical saturation was reached based on the number of academics, there may have been other concepts that were not covered.

7.4 Recommendations and Future direction

Interesting insights arose during the process of theoretical integration. The methodology carried out in this case study opened up more opportunities for further research on different IS research domains, particularly on voluntary system usage. Some recommendations and future direction include:

- A deeper analysis of log files of usage by academics which can be done using a longitudinal study or an action research approach. Analyzing log files can help visualize the interaction patterns of academics with their students;
- Analysis of students' interaction in the log files. It would be worthy to examine the extent to which students interact and collaborate with each other and with their teacher through the LMS, and the extent to which this has accelerated the quality of teaching and learning;
- As mentioned previously, implementation of the model and its re-evaluation when changes or improvements have been made, in conjunction with the university's monitoring, evaluation and learning system (MELS). The continuous assessment of the applicability and transportability of the model is another research agenda;
- Through continuous assessment, tighten the quality control for all on-going training programs and training courses university-wide which was also mentioned above; and

- Consideration of an evaluative research for academics' usage within department or subject area; or in a wider scope, a comparison of usage across subject disciplines in various colleges of the university.

7.5 Final Remarks

This research has developed a model that other universities or researchers can possibly adapt in their own contexts that can assist in increasing and improving LMS usage. Significantly, it has proposed an 'extra rich' system usage type of measure, thereby expanding the system usage measure put forward by Burton-Jones and Straub (2006). Using an 'extra rich' measure in LMS-use related studies may help individuals or institutions identify the elements or dimensions that they need to examine when assessments and evaluations are needed.

The theoretical and practical implications outlined above, as well as the research processes that this study has undertaken, are hoped to be useful to educational institutions and IS research communities. Overall, this research has answered the main research question on how academics use the learning management system in this university. This study concludes that academics have different internal (intrinsic) and external (extrinsic) motivators and constraints affecting their context-specific patterns of LMS use.

Indeed, access to and co-construction of knowledge using LMS and hybrid methods does compress time and space. It empowers students and academics to utilize cutting-edge materials sourced locally and internationally, therefore instilling competitiveness. It fosters innovative ways of engagement within and without the virtual classroom, and encourages equal opportunity for online participation, granting that infrastructure and management-related issues have been well managed. The future of online learning in relatively resource poor contexts does unlock opportunities for national and transnational collaboration, thus, should be harnessed.

APPENDICES

APPENDIX A: Ethics Language Statement

RMIT UNIVERSITY

School of
Business IT and Logistics

Building 108 Level 17
239 Bourke Street
Melbourne VIC 3000
Australia

Tel. +61 3 9925 5969
Fax +61 3 9925 5850
www.rmit.edu.au

INVITATION TO PARTICIPATE IN A RESEARCH PROJECT

Project Title:

Investigating various LCMS usage patterns in an academic web portal: A case study in higher education in the Philippines

Investigators:

- Cenie Vilela-Malabanan (PhD Scholar), School of Business IT & Logistics, RMIT University cenie.vilela@rmit.edu.au; 9925-1509
- Martin Dick, PhD (Primary Supervisor, Senior Lecturer), School of business IT & Logistics, RMIT University, martin.dick@rmit.edu.au; 9925-5976
- Konrad Peszynski, PhD (Second Supervisor, Senior Lecturer), School of Business IT & Logistics, RMIT University, konrad.peszynski@rmit.edu.au; 9925.1654
- Vince Bruno, PhD (Third Supervisor, Lecturer), School of business IT & Logistics, RMIT University, vince.bruno@rmit.edu.au; 9925.5784

Dear ……,

You are invited to participate in a research project being conducted by RMIT University in the School of Business IT and Logistics. Please read this sheet carefully and be confident that you understand its contents before deciding whether to participate. If you have any questions about the project, please ask one of the investigators.

Who is involved in this research project?

This research is being conducted as part of a PhD program in Business Information Technology which is being undertaken by Cenie Vilela-Malabanan, the student investigator. This research project has been approved by the RMIT Human Research Ethics Committee., and was also given approval by the MSU-Iligan Institute of Technology (MSU-IIT) through the Office of the Vice Chancellor for Academic Afffairs (OVCAA), and the Director of the Institute Computer Facilities and Support Services – ICFSS (or Computer Center)

Why is it being conducted?

This research is being conducted to elicit information regarding the usage patterns of faculty members or academics that are using the Learning Content Management System (LCMS) as support in their delivery of instruction in higher education. The LCMS used at MSU-IIT is MOODLE – an open-source computer software which is commonly called MOLÉ (an acronym for MSU-IIT Online Learning Environment).

The data elicited will then be used, together with current usage pattern research, obtained from the literature, to develop a framework that can be used to inform and guide academics how to maximise the use of the LCMS as a teaching and learning tool. Also, information may help MSU-IIT and other educational institutions how to effectively navigate the LCMS; encourage other academics to use the system; and to be informed of the benefits and constraints of the purely online learning paradigm.

Why have you been approached?

This student investigator was granted permission (letter dated February 17, 2012) by the Vice Chancellor for Academic Affairs to conduct this research at MSU-IIT including gathering of interview data, and computer log files.

You, the participant, are being invited based on a list provided by the MSU-IIT's Computer Center. You had been included in the list because you are one of the faculty members who use MOLÉ in the undergraduate and graduate courses. Your voluntary participation will require some time to discuss through a one-on-one interview about the usage patterns and factors affecting the use of MOLÉ.

What is the project about? What are the questions being addressed?
This research seeks to investigate academics' various usage patterns in an academic web portal in one of the institutions of higher learning in the Philippines (i.e., MSU-IIT). The main aim of this study is to determine how faculty members from different disciplines of the undergraduate and graduate degree programs in this institution use the LCMS (or MOLÉ) to support in the delivery of instructions.

The main research question being addressed is:

What is the current usage of LCMS in the university?

The following sub-questions follow:

What are the obstacles to more effective usage of the LCMS?
How are the academics using it?
What issues and challenges affect their usage patterns?

It is intended to interview 20 to 30 academics individually, with open-ended questions. The following topics of inquiry will be centred on: (1) an account of experiences with the LCMS; (2) attitude towards using LCMS; (3) frequency of use and reasons for using or not using the LCMS; (4) issues and challenges; and (5) workarounds used or initiated (e.g. strategies or techniques used to resolve issues and challenges).

If I agree to participate, what will I be required to do?
If you agree to participate, an agreed date, time, and venue for a 1-hour interview (or less) will be requested. Before the open-ended interview will commence, some basic information will be asked which include age, number of years teaching, number of years using the LCMS, college or school where you belong, current subject taught in undergraduate/graduate courses and how many, subject using the LCMS, language use for instruction and/or communication with students, associates, and superiors.

The open-ended interview will focus on topics stated above. Your participation and confirmation will also indicate that your MOLÉ computer log files in school year 2011-2012 (i.e., from June 2011 to March 2012) which are stored in the Institute's databases will be gathered for analysis.

What are the possible risks or disadvantages?
There are no apparent risks in participating in this research. It involves discussions based on a professional level only. If you (the participant) are unduly concerned about your responses to any of the interview questions or discussions, or if you find participation in the interview distressing, you should advise the research investigator that you either want to delete the recorded discussion, or discontinue the interview. In the same manner, you should give advice if you do not want to have your MOLÉ computer log files accessed. The researchers will discuss your concerns with you confidentially and suggest appropriate follow-up, if necessary.

What are the benefits associated with participation?
Participation in this project will benefit the stakeholders of the institution, providing incite on how usage patterns of academics may help contribute to the development of the LCMS, suggest policies on usage and how to maximise it, and help create a framework that will guide individuals in the use of the system. For the participant, the researchers can offer any results, papers, and other outcomes (such as providing copies of articles) that may be published on journals, conference proceedings, or other form of media. This study may also provide an avenue for future research partnerships between MSU-IIT, RMIT University, and other educational institutions.

What will happen to the information I provide?
All recorded data will be transcribed and encrypted / coded, and archived. The transcribed data will be kept during the analysis phase of the research on the primary researcher's desktop computer and will be stored at RMIT in the School of Business IT and Logistics. A USB storage device will be used to backup the encrypted data, and will be stored in a secure place (offsite at primary researcher's residence).

Safeguards for anonymity and confidentiality are ensured. You (the participant) will remain anonymous and cannot be identified at any stage of the research. Confidentiality is ensured because identified data will be seen by only this research investigator and her research supervisors: Dr. Martin Dick, Dr. Konrad Peszynski, and Dr. Vince Bruno.

Any information that you provide can be disclosed only if (1) it is to protect you or others from harm, (2) a court order is produced, or (3) you provide the researchers with written permission.

Permission will be obtained from the participants before use if the data is required for some other purposes (other than use in this project).

The results of this research will be disseminated in a thesis, papers for publication (e.g. journals), or conferences/conference proceedings. Pseudonyms will be used when quotes are necessary for inclusion. Research data will be kept securely at RMIT for 5 years after publication, before being destroyed.

What are my rights as a participant?
You have the right to withdraw from participation at any time, without prejudice. You have the right to request that any recording cease. You have the right to have any unprocessed data withdrawn and destroyed, provided it can be reliably identified, and provided that so doing does not increase the risk for the participant. You have the right to have any questions answered at any time, in relation to the project and your participation.

Whom should I contact if I have any questions?
The primary investigator (Cenie Vilela-Malabanan – cenie.vilela@rmit.edu.au or +61 3 99251509), or her primary supervisor (Dr. Martin Dick – martin.dick@rmit.edu.au or 61 3 99255976) should be contacted; contact details given previously.

What other issues should I be aware of before deciding whether to participate?
There are no other ethical issues that I (the primary investigator) think you (the participant) should be aware of before deciding whether you want to participate. Nevertheless, please feel free to contact me or my supervisory team, in relation to this research.

Yours sincerely,

Cenie Vilela-Malabanan
Master of IT (Information Systems)

Dr. Martin Dick
Doctor of Philosophy in Computing

Dr. Konrad Peszynski
Doctor of Philosophy in Information Systems

Dr Vince Bruno
Doctor of Philosophy in Business IT

All researchers must sign the information sheet, with his/her qualification/s listed below each name.

If you have any complaints about your participation in this project please see the complaints procedure on the Complaints with respect to participation in research at RMIT page

APPENDIX B: Ethics Consent Form

PARTICIPANT'S CONSENT

1. I have had the project explained to me, and I have read the information sheet
2. I agree to participate in the research project as described
3. I agree to be interviewed and/or complete a questionnaire; and agree that my voice will be audio recorded
4. I agree that my computer log files stored in MSU-IIT's MOLÉ server will be accessed for analysis.
5. I acknowledge that:

   (a) I understand that my participation is voluntary and that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied (unless follow-up is needed for safety).
   (b) The project is for the purpose of research. It may not be of direct benefit to me.
   (c) The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law.
   (d) The security of the research data will be protected during and after completion of the study. The data collected during the study may be published, and a report of the project outcomes will be provided to MSU-Iligan Institute of Technology. Any information which will identify me will not be used.

Participant's Consent

Participant: _____ Date: _____
(Signature)

Participants should be given a photocopy of this PICF after it has been signed.

APPENDIX C: Participants' Details

Acad ID	Participant	Discipline	Position	Teaching Range	Prog Level	Gender	Age Range	Usage Mode	Training Mode	MOLE Experience
1	Danilo	A	N	31-45	HUD	M	45-65	ALT	Trained	1-10
2	Julian	A	Ad	16-30	HUD	M	45-65	MOLE	Self-trained	1-10
3	Miguel	C	N	1-15	UG	M	25-44	MOLE	Trained	1-10
4	Julia	B	Ad	1-15	UG	F	25-44	MOLE	Self-trained	1-10
5	Pancho	C	Ad	16-30	HUD	M	25-44	MOLE	Self-trained	11-20
6	Andres	C	N	1-15	UG	M	25-44	MOLE	Self-trained	11-20
7	Corazon	A	N	16-30	HUD	F	25-44	ALT	Self-trained	1-10
8	Zosimo	A	Ad	31-45	HUD	M	45-65	ALT	Trained	0
9	Gilda	B	N	31-45	HUD	F	45-65	MOLE	Trained	1-10
10	Daniel	C	N	1-15	UG	M	25-44	ALT	Trained	0
11	Caridad	C	N	16-30	UG	F	45-65	ALT	Trained	0
12	Carmina	A	Ad	31-45	HUD	F	45-65	ALT	Trained	1-10
13	Maria	B	N	31-45	UG	F	45-65	MOLE	Trained	11-20
14	Susana	B	Ad	16-30	UG	F	45-65	MOLE	Trained	1-10
15	Teresita	B	N	1-15	UG	F	25-44	SUP	Trained	1-10
16	Paz	A	Ad	16-30	HUD	F	45-65	ALT	Untrained	0
17	Francisco	C	Ad	31-45	HUD	M	45-65	MOLE	Trained	1-10
18	Ana	B	Ad	31-45	HUD	F	45-65	MOLE	Trained	11-20
19	Olivia	A	Ad	16-30	HUD	F	45-65	MOLE	Trained	11-20
20	Luis	C	N	1-15	UG	M	45-65	SUP	Self-trained	1-10
21	Arlene	C	Ad	31-45	HUD	F	45-65	ALT	Trained	0
22	Gloria	B	Ad	31-45	HUD	F	45-65	MOLE	Trained	11-20
23	Delia	B	N	1-15	HUD	F	25-44	SUP	Trained	1-10
24	Alfonso	C	N	1-15	HUD	M	25-44	ALT	Trained	1-10
25	Ricardo	A	N	1-15	UG	M	25-44	MOLE	Trained	1-10
26	German	B	N	1-15	UG	M	25-44	MOLE	Trained	1-10
27	Renato	C	N	1-15	UG	M	25-44	SUP	Trained	1-10
28	Carlito	A	N	16-30	UG	M	45-65	MOLE	Self-trained	1-10
29	Lucia	A	N	16-30	HUD	F	45-66	ALT	Untrained	0
30	Veronica	B	N	1-15	UG	F	25-44	ALT	Trained	1-10
31	Patricio	B	Ad	31-45	HUD	M	45-65	SUP	Self-trained	11-20
32	Samuel	C	N	1-15	UG	M	25-44	MOLE	Self-trained	1-10
33	Lucila	A	N	1-15	HUD	F	25-44	SUP	Trained	1-10

Legend:**Discipline:**A (Engineering, Science & Mathematics, Eng'g Technology); B (Education, Arts & Social Sciences);C (Business; Computer Science and Information Technology, Electronics Eng Tech., Nursing)**Position:**Ad - administrator; N – Non administrator;**Program Level:**UG (Undergraduate); HUD (Higher degree and Undergrduate degree); UG –Under-graduate; HUD – Higher and undergraduate degree;**Gender**: M (Male); F (Female); F – Female; M – Male;**UsageMode:**ALT: alternative; SUP: supplemented; MOLÉ: MOLÉ only**; Training mode**: trainied, untrained, self-trained**; MOLE experience** in semesters

APPENDIX D: Average and Median values for Age, Teaching Service, and MOLÉ Experience

Acad ID	Age
25 to 44 (15)	
3	25
25	25
32	27
10	28
27	28
26	29
6	30
30	30
4	31
24	32
15	33
33	34
23	36
5	38
7	44
Average	**31.33**
Median	**30.00**
45 to 65 (18)	
20	45
11	47
16	51
28	52
31	57
2	58
14	58
19	58
8	59
21	59
29	59
9	60
1	61
13	61
17	62
22	63
12	65
18	65
Average	**57.78**
Median	**59.00**

Acad ID	Years of Teaching Service
1 to 15 (14)	
32	3
25	4
26	4
3	5
24	5
10	6
15	6
27	6
33	6
20	7
30	7
6	9
4	10
23	15
Average	**6.64**
Median	**6.00**
16 to 30 (9)	
5	18
7	19
14	20
16	20
28	20
11	24
19	26
2	30
29	30
Average	**23.00**
Median	**20.00**
1	35
8	35
21	35
31	35
9	37
17	39
13	40
22	40
18	41
12	45
Average	**38.20**
Median	**38.00**

Acad ID	Semesters of MOLÉ Experience
0 (6)	
8	0
10	0
11	0
16	0
29	0
21	0
Average	**0.00**
Median	**0.00**
1 to 10 (20)	
30	1
24	1
1	2
27	2
33	2
25	4
28	4
7	4
14	6
15	6
17	6
23	6
32	6
3	8
26	8
2	10
4	10
9	10
20	10
12	10
Average	**5.80**
Median	**6.00**
11 to 20 (7)	
13	12
18	12
22	12
19	14
6	16
31	16
5	20
Average	**16.50**
Median	**16.00**

APPENDIX E: Open-coded themes

	A : Alternative to MOLE	B : Attitude towards LCMS use_ACADEMICS	C : Challenges and work-arounds	D : Comments recommendations an suggestions	E : Demographics	F : Describing the system	G : Factors affecting usage of LCMS or alternative system	H : Features used or unused	I : Frequency of use	J : Issues and work-arounds	K : Student concerns	L : System and technology related issues	M : Teaching strategy
1: Alternative to MOLE	12	0	0	0	0	0	0	0	0	0	1	0	0
2 : Electronic file given to students on USB or CD	1	0	0	0	0	0	0	0	0	0	1	0	0
3 : Other systems used to complement classes	0	0	0	0	0	0	0	0	0	0	0	0	0
4 : Class management strategies	0	0	0	0	0	0	0	0	0	0	0	0	0
5 : Feeling towards other systems	0	0	0	0	0	0	0	0	0	0	0	0	0
6 : Access and security	1	0	0	0	0	0	0	0	0	0	0	0	0
7 : Apprehensive on effects	0	0	0	0	0	0	0	0	0	0	0	0	0
8 : Easier to use	0	0	0	0	0	0	0	0	0	0	0	0	0
9 : Frequently used	0	0	0	0	0	0	0	0	0	0	0	0	0
10 : Happy	0	0	0	0	0	0	0	0	0	0	0	0	0
11: Motivated to use because it become extension of class	0	0	0	0	0	0	0	0	0	0	0	0	0
12 : Speed problems and Internet connectivity	0	0	0	0	0	0	0	0	0	0	0	0	0
13 : Time efficient	0	0	0	0	0	0	0	0	0	0	0	0	0
14 : Useful	0	0	0	0	0	0	0	0	0	0	0	0	0
15 : Students' reaction	0	0	0	0	0	0	0	0	0	0	0	0	0
16 : Use Facebook	0	0	0	0	0	0	0	0	0	0	0	0	0
17 : Powerpoint in class	1	0	0	0	0	0	0	0	0	0	0	0	0
18 : Provide handouts	1	0	0	0	0	0	0	0	0	0	1	0	0
19 : Require students to submit assigments on CD	0	0	0	0	0	0	0	0	0	0	0	0	0
20 : Attitude towards LCMS use_ACADEMICS	0	65	0	0	0	0	0	0	0	0	0	0	2
21: MOT_Allows file management	0	0	0	0	0	0	0	0	0	0	0	0	0
22 : MOT_Availability of Internet and resources	0	0	0	0	0	0	0	0	0	0	0	0	0
23 : MOT_Being updated with communication technology	0	0	0	0	0	0	0	0	0	0	0	0	0
24 : MOT_Curiousity	0	0	0	0	0	0	0	0	0	0	0	0	0
25 : MOT_Desire to learn	0	0	0	0	0	0	0	0	0	0	0	0	0
26 : MOT_Easy to use	0	2	0	0	0	1	0	0	0	0	0	0	0
27 : MOT_Encourage Participation and Interaction	0	0	0	0	0	0	0	0	0	0	0	0	2
28 : MOT_Forefront of innovation	0	0	0	0	0	0	0	0	0	0	0	0	0
29 : MOT_Grouping of Responses	0	0	0	0	0	0	0	0	0	0	0	0	1
30 : MOT_Improves teaching and learning	0	0	0	0	0	0	0	0	0	0	0	0	0
31: MOT_Keep track with students' pace	0	0	0	0	0	0	0	0	0	0	0	0	0
32 : MOT_Opportunity to reflect on techniques and methodologies	0	0	0	0	0	0	0	0	0	0	0	0	0
33 : MOT_Philosophical and personal motivation	0	0	0	0	0	0	0	0	0	0	0	0	0
34 : MOT_Resource accession	0	0	0	0	0	0	0	0	0	0	0	0	0
35 : MOT_Use anytime, anywhere	0	0	0	0	0	0	0	0	0	0	0	0	0
36 : MOT_Wanting to learn	0	0	0	0	0	0	0	0	0	0	0	0	0
37 : NEG_Apprehension about effectivity	0	5	0	0	0	0	0	0	0	0	0	0	0
38 : NEG_Did not see it useful for my subject	0	0	0	0	0	0	0	0	0	0	0	0	0
39 : NEG_Difficulty because of age of grad students	0	2	0	0	0	0	0	0	0	0	0	0	0
40 : NEG_Excitement not sustained	0	0	0	0	0	0	0	0	0	0	0	0	0
41: POS_Challenging students to do better	0	4	0	0	0	0	0	0	0	0	0	0	0
42 : POS_Commitment	0	3	0	0	0	0	0	0	0	0	0	0	0
43 : POS_Complementation	0	0	0	0	0	0	0	0	0	0	0	0	2
44 : POS_Convenient	0	10	0	0	0	0	0	0	0	0	0	0	0
45 : POS_Doing some steps towards using technology	0	2	0	0	0	0	0	0	0	0	0	0	0
46 : POS_Eager to learn new things	0	6	0	0	0	0	0	0	0	0	0	0	0
47 : POS_Feels gratified	0	2	0	0	0	0	0	0	0	0	0	0	0
48 : POS_Finds it easy to learn	0	2	0	0	0	0	0	0	0	0	0	0	0
49 : POS_Finds it helpful to the environment	0	2	0	0	0	0	0	0	0	0	0	0	0
50 : POS_Finds it necessary for Graduate students	0	2	0	0	0	0	0	0	0	0	0	0	0
51: POS_Finds it useful	0	6	0	0	0	0	0	0	0	0	0	0	0
52 : POS_Happy with MOLE	0	14	0	0	0	0	0	0	0	0	0	0	0
53 : POS_Keen to use	0	0	0	0	0	0	0	0	0	0	0	0	0
54 : POS_Need to adjust requirements	0	4	0	0	0	0	0	0	0	0	0	0	0
55 : POS_Open	0	2	0	0	0	0	0	0	0	0	0	0	0
56 : POS_Persevere to learn how to use	0	2	0	0	0	0	0	0	0	0	0	0	0
57 : POS_Reuse resources	0	2	0	0	0	0	0	0	0	0	0	0	0
58 : POS_Saved me money	0	2	0	0	0	0	0	0	0	0	0	0	2
59 : POS_Self-motivated	0	2	0	0	0	0	0	0	0	0	0	0	0
60 : POS_Useful when having official trips	0	4	0	0	0	0	0	0	0	0	0	0	0
61: Challenges and work-arounds	0	0	6	0	0	0	0	0	0	0	0	2	0
62 : Challenges	0	0	2	0	0	0	0	0	0	0	0	1	0
63 : Bandwidth problem	0	0	0	0	0	0	0	0	0	0	0	0	0
64 : Being visual rather than use good language	0	0	0	0	0	0	0	0	0	0	0	0	0
65 : Classroom and laboratory facilities	0	0	2	0	0	0	0	0	0	0	0	0	0
66 : Cross-checking	0	0	1	0	0	0	0	0	0	0	0	0	0
67 : Designing my lecture notes	0	0	0	0	0	0	0	0	0	0	0	0	0
68 : Developing maturity of the user	0	0	0	0	0	0	0	0	0	0	0	0	0
69 : Developing modules	0	0	0	0	0	0	0	0	0	0	0	0	0
70 : Effect on Teaching Efficiency Rating (TER)	0	0	0	0	0	0	0	0	0	0	0	0	0
71: Frustrated with students' critical analysis skills set	0	0	0	0	0	0	0	0	0	0	0	0	0
72 : Improving control systems	0	0	1	0	0	0	0	0	0	0	0	0	0
73 : Instituting policy for online delivery	0	0	1	0	0	0	0	0	0	0	0	0	0
74 : Keeping up with new trends	0	0	0	0	0	0	0	0	0	0	0	0	0
75 : Learn other features	0	0	0	0	0	0	0	0	0	0	0	0	0
76 : Learning curve steep	0	0	0	0	0	0	0	0	0	0	0	0	0
77 : Management funding support	0	0	0	0	0	0	0	0	0	0	0	0	0
78 : Motivating the teachers	0	0	0	0	0	0	0	0	0	0	0	0	0
79 : Need for community of users among academics	0	0	0	0	0	0	0	0	0	0	0	0	0
80 : Need to democratize	0	0	0	0	0	0	0	0	0	0	0	0	0
81: Need to improve infrastructure	0	0	0	0	0	0	0	0	0	0	0	0	0
82 : Needed features are not there	0	0	1	0	0	0	0	0	0	0	0	1	0
83 : Needed to be trained on pedagogical techniques	0	0	0	0	0	0	0	0	0	0	0	0	0
84 : Preparation time	0	0	0	0	0	0	0	0	0	0	0	0	0
85 : Too much reliance on MOLE	0	0	0	0	0	0	0	0	0	0	0	0	0

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(continuation of Appendix E)

86 : Using the exam features	0	0	0	0	0	0	0	0	0	0	0	0	0
87 : Websites referred inaccessible	0	0	1	0	0	0	0	0	0	0	0	1	0
88 : Workload	0	0	0	0	0	0	0	0	0	0	0	0	0
89 : Work-arounds for challenges	0	0	0	0	0	0	0	0	0	0	0	1	0
90 : Advocacy for management recognition of online learning	0	0	0	0	0	0	0	0	0	0	0	0	0
91: Alternative websites	0	0	0	0	0	0	0	0	0	0	0	0	0
92 : Classroom Validation	0	0	0	0	0	0	0	0	0	0	0	0	1
93 : Converting files	0	0	0	0	0	0	0	0	0	0	0	1	0
94 : Cross-checking	0	0	0	0	0	0	0	0	0	0	0	0	0
95 : Ensure time allocation to prepare materials	0	0	0	0	0	0	0	0	0	0	0	0	0
96 : Journal entry	0	0	0	0	0	0	0	0	0	0	0	0	0
97 : Suggest for further training of students	0	0	0	0	0	0	0	0	0	0	0	0	0
98 : Suggest to improve faci;ities	0	0	0	0	0	0	0	0	0	0	0	0	0
99 : Use computer lab	0	0	0	0	0	0	0	0	0	0	0	0	0
100 : Comments recommendations and suggestions	0	0	0	11	0	0	0	0	0	0	0	0	0
101: About academic freedom	0	0	0	1	0	0	0	0	0	0	0	0	0
102 : For co-teachers	0	5	0	3	0	0	0	0	0	0	0	0	0
103 : For the university administrators	0	0	0	7	0	0	0	0	0	0	0	0	0
104 : Demographics	0	0	0	0	1	0	0	0	0	0	0	0	0
105 : Gender	0	0	0	0	0	0	0	0	0	0	0	0	0
106 : Female	0	0	0	0	0	0	0	0	0	0	0	0	0
107 : Male	0	0	0	0	0	0	0	0	0	0	0	0	0
108 : Load_ teaching and administrative	0	0	0	0	0	0	0	0	0	0	0	0	0
109 : Graduate couses only	0	0	0	0	0	0	0	0	0	0	0	0	0
110 : Teaching both Grad and UG	0	0	0	0	0	0	0	0	0	0	0	0	0
111: Teaching with administrative load	0	2	1	0	0	0	0	0	0	0	0	0	0
112 : Undergraduate courses only	0	0	0	0	0	0	0	0	0	0	0	0	0
113 : Online learning environment	0	0	0	0	0	0	0	0	0	0	0	0	0
114 : Training	0	0	0	0	0	0	0	0	0	0	0	0	0
115 : Not trained on MOLE	0	0	0	0	0	0	0	0	0	0	0	0	0
116 : Yes trained on MOLE	0	0	0	0	0	0	0	0	0	0	0	0	0
117 : Usage of online environment	0	0	0	0	0	0	0	0	0	0	0	0	0
118 : Do not use any	0	0	0	0	0	0	0	0	0	0	0	0	0
119 : Stopped using MOLE	0	0	0	0	0	0	0	0	0	0	0	0	0
120 : Use MOLE only	0	0	0	0	0	0	0	0	0	0	0	0	0
121: Uses alternative only	0	0	0	0	0	0	0	0	0	0	0	0	0
122 : Uses MOLE and alternative	0	0	0	0	0	0	0	0	0	0	0	0	0
123 : Range_Age	0	0	0	0	1	0	0	0	0	0	0	0	0
124 : Age_25 to 44	0	0	0	0	0	0	0	0	0	0	0	0	0
125 : Age_45 to 65	0	0	0	0	1	0	0	0	0	0	0	0	0
126 : Range_MOLE usage years	0	0	0	0	0	0	0	0	0	0	0	0	0
127 : 1to 2 years	0	0	0	0	0	0	0	0	0	0	0	0	0
128 : 3 to 4 years	0	0	0	0	0	0	0	0	0	0	0	0	0
129 : 5 to 8 years	0	0	0	0	0	0	0	0	0	0	0	0	0
130 : 9 to 10 years	0	0	0	0	0	0	0	0	0	0	0	0	0
131: Range_Teaching years	0	0	0	0	0	0	0	0	0	0	0	0	0
132 : Teaching_31to 45 years	0	0	0	0	0	0	0	0	0	0	0	0	0
133 : Teaching_1to 15 years	0	0	0	0	0	0	0	0	0	0	0	0	0
134 : Teaching_16 to 30 years	0	0	0	0	0	0	0	0	0	0	0	0	0
135 : Describing the system	0	0	0	0	0	2	0	0	0	0	0	0	0
136 : Allows collaboration	0	2	0	0	0	0	0	0	0	0	0	0	0
137 : Allows posting of reading materials, announcements, & resources	0	0	0	0	0	0	0	0	1	0	0	0	0
138 : Content improvement	0	0	0	0	0	0	0	0	0	0	0	0	0
139 : Giving feedback	0	7	0	0	0	0	0	0	0	0	0	0	1
140 : Good venue for interaction with students	0	0	0	0	0	0	0	0	0	0	0	0	0
141: High level assessments	0	0	0	0	0	0	0	0	0	0	0	0	2
142 : Improve teaching and learning	0	0	0	0	0	0	0	0	0	0	0	0	1
143 : Interface acceptability	0	0	0	0	0	0	0	0	0	0	0	0	0
144 : Learning resource repository	0	0	0	0	0	0	0	1	0	0	0	0	0
145 : Not easy and not comfortable to use	0	0	0	0	0	0	0	0	0	0	0	0	0
146 : Plenty untapped features yet	0	0	0	0	0	1	0	0	0	0	0	0	0
147 : Re-usable content	0	0	0	0	0	0	0	0	0	0	0	0	0
148 : Used for monitoring students	0	2	0	0	0	0	0	0	0	0	0	0	0
149 : User-friendly	0	0	0	0	0	1	0	0	0	0	0	0	0
150 : Factors affecting usage of LCMS or alternative system	0	0	0	0	0	0	9	0	0	0	0	0	0
151: Cultural	0	0	0	0	0	0	2	0	0	1	0	0	0
152 : Economical	0	0	0	0	0	0	3	0	0	0	0	0	0
153 : Pedagogical	0	0	0	0	0	0	2	0	0	0	0	0	0
154 : Psychological	0	0	0	0	0	0	0	0	0	0	0	0	0
155 : Teaching presence	0	0	0	0	0	0	3	0	0	0	0	0	0
156 : Technological	0	0	0	0	0	0	1	0	0	0	0	0	0
157 : Features used or unused	0	0	0	0	0	0	0	6	0	0	0	0	0
158 : Analytics	0	0	0	0	0	1	0	0	0	0	0	0	0
159 : Assessment	0	2	0	0	0	0	0	1	0	0	0	0	0
160 : Assignments	0	0	0	0	0	0	0	0	0	0	0	0	0
161: Chat	0	0	0	0	0	0	0	1	0	0	0	0	0
162 : Communication tools	0	0	0	0	0	0	0	0	0	0	0	0	0
163 : Discussion Forum	0	2	0	0	0	0	0	0	0	0	0	0	0
164 : Email	0	0	0	0	0	0	0	1	0	0	0	0	0
165 : Exam and Quiz	0	3	0	0	0	0	0	1	0	0	0	0	0
166 : Journal	0	0	0	0	0	0	0	0	0	0	0	0	1
167 : News Forum	0	0	0	0	0	0	0	0	0	0	0	0	0
168 : Online survey	0	0	0	0	0	1	0	0	0	0	0	0	0
169 : Treasure hunt	0	0	0	0	0	0	0	1	0	0	0	0	0
170 : Webquest	0	0	0	0	0	0	0	1	0	0	0	0	0
171: Wiki	0	0	0	0	0	0	0	1	0	0	0	0	0
172 : Frequency of use	0	0	0	0	0	0	0	0	3	0	0	0	0
173 : Regular use	0	0	0	0	0	0	0	0	3	0	0	0	0
174 : When on travel	0	0	0	0	0	0	0	0	0	0	0	0	0
175 : Issues and work-arounds	0	0	0	0	0	0	0	0	0	10	0	0	0
176 : Issues	0	0	0	0	0	0	0	0	0	1	0	1	0
177 : Accessibility problems	0	0	0	0	0	0	0	0	0	0	0	0	0
178 : Certification as qualified online teacher	0	0	0	0	0	0	0	0	0	1	0	0	0
179 : Compensation scheme	0	0	0	0	0	0	0	0	0	2	0	0	0
180 : Conduct rationalized faculty training	1	0	0	0	0	0	0	0	0	0	0	0	0
181: Connectivity	0	0	0	0	0	0	0	0	0	0	0	0	0
182 : Contact hour	0	0	0	0	0	0	0	0	0	1	0	0	0
183 : Copyright	0	0	0	0	0	0	0	0	0	1	0	0	0
184 : Culture and discipline of use	0	0	0	0	0	0	0	0	0	0	0	0	0
185 : Do not find it useful for my subject	0	0	0	0	0	0	0	0	0	0	0	0	0
186 : Element of trust	0	0	0	0	0	0	0	0	0	1	0	0	0

(continuation of Appendix E)

187 : Helpdesk	0	0	0	0	0	0	0	0	0	1	0	0	0
188 : Decentralization needed	0	0	0	0	0	0	0	0	0	1	0	0	0
189 : Quality assurance	0	0	0	0	0	0	0	0	0	1	0	0	0
190 : Level of maturity on technology use	0	0	0	0	0	0	0	0	0	1	0	0	0
191: Mode of control of students	0	0	1	0	0	0	0	0	0	0	0	0	0
192 : Need funds for faculty training	0	0	0	0	0	0	0	0	0	0	0	0	0
193 : Need to disseminate information	0	0	0	0	0	0	0	0	0	0	0	0	0
194 : No time to undergo training	0	0	0	0	0	0	0	0	0	0	0	0	0
195 : Not easy to use	0	0	0	0	0	0	0	0	0	0	0	0	0
196 : Others	0	0	0	0	0	0	0	0	0	0	0	0	0
197 : Plagiarism and Intellectual issues	0	0	0	0	0	0	0	0	0	0	0	0	0
198 : Policies on delivering instructions online	0	0	0	0	0	0	0	0	0	1	0	0	0
199 : Prone to abuse	0	0	0	0	0	0	0	0	0	0	0	0	0
200 : Security of online tests	0	0	0	0	0	0	0	0	0	0	0	0	0
201: Speed of connection	0	0	0	0	0	0	0	0	0	1	0	1	0
202 : Time-consuming to prepare	0	0	0	0	0	0	0	0	0	0	0	0	0
203 : Work-arounds for issues	0	0	0	0	0	0	0	0	0	1	0	1	0
204 : Design better strategies for online classroom	0	0	0	0	0	0	0	0	0	0	0	0	0
205 : Design other strategy for F2F class	0	0	0	0	0	0	0	0	0	0	0	0	0
206 : Fix basic access problems in class	0	0	0	0	0	0	0	0	0	0	0	0	0
207 : Knowledge sharing	0	0	0	0	0	0	0	0	0	0	0	0	0
208 : Minimize graphics	0	0	0	0	0	0	0	0	0	0	0	0	0
209 : Remind students to submit on time	0	0	0	0	0	0	0	0	0	0	0	0	0
210 : Requirements submission alternative	0	0	0	0	0	0	0	0	0	0	0	0	0
211: Reset the deadline	0	0	0	0	0	0	0	0	0	0	0	1	0
212 : Special-purpose online laboratory	0	0	0	0	0	0	0	0	0	0	0	0	0
213 : Still think of measures to validate	0	0	0	0	0	0	0	0	0	0	0	0	0
214 : Validate in class	0	0	0	0	0	0	0	0	0	1	0	0	0
215 : Student concerns	1	0	0	0	0	0	0	0	0	0	7	0	1
216 : Belief that IIT have quality students	0	0	0	0	0	0	0	0	0	0	1	0	0
217 : Has difference when used in G and UG classes	0	0	0	0	0	0	0	0	0	0	0	0	0
218 : Has NO difference when used in G and UG	0	0	0	0	0	0	0	0	0	0	1	0	1
219 : Need further training on use	0	0	0	0	0	0	0	0	0	0	0	0	0
220 : Ownership of computer unit	1	0	0	0	0	0	0	0	0	0	4	0	0
221: Problem without own computer	1	2	0	0	0	0	0	0	0	0	2	0	0
222 : Socio-economic status of students	0	0	0	0	0	0	0	0	0	0	0	0	0
223 : Students' attitude towards LCMS use	0	0	0	0	0	0	0	0	0	0	1	0	2
224 : Aloof and have phobia	0	0	0	0	0	0	0	0	0	0	0	0	0
225 : Apprehensive because of age	0	2	0	0	0	0	0	0	0	0	0	0	0
226 : Apprehensive because of course background	0	0	0	0	0	0	0	0	0	0	0	0	0
227 : Are happy	0	0	0	0	0	0	0	0	0	0	0	0	0
228 : Enjoying or loving it	0	0	0	0	0	0	0	0	0	0	0	0	0
229 : Are intrigued to use	0	0	0	0	0	0	0	0	0	0	0	0	0
230 : Complaints	0	0	0	0	0	0	0	0	0	0	0	0	0
231: Could have psychological reasons	0	0	0	0	0	0	0	0	0	0	0	0	0
232 : Difference in past academic institution	0	0	0	0	0	0	0	0	0	0	0	0	0
233 : Element of responsibility	0	0	0	0	0	0	0	0	0	0	1	0	0
234 : Element of Trust	0	0	0	0	0	0	0	0	0	0	1	0	2
235 : Eventually liked using MOLE	0	0	0	0	0	0	0	0	0	0	0	0	0
236 : Fear of exposing privacy unnecessarily	0	0	0	0	0	0	0	0	0	0	0	0	0
237 : Independent	0	0	0	0	0	0	0	0	0	0	0	0	0
238 : Not too excited to use	0	0	0	0	0	0	0	0	0	0	0	0	0
239 : Useful for Grad students	0	2	0	0	0	0	0	0	0	0	1	0	0
240 : Varied mindsets	0	4	0	0	0	0	0	0	0	0	0	0	2
241: Wait and see atitude	0	0	0	0	0	0	0	0	0	0	0	0	0
242 : System and technology related issues	0	0	2	0	0	0	0	0	0	0	0	7	0
243 : Activation problems	0	0	0	0	0	0	0	0	0	0	0	0	0
244 : Affect the effect	0	0	0	0	0	0	0	0	0	0	0	0	0
245 : Constraints on using technology other than MOLE	0	0	0	0	0	0	0	0	0	0	0	0	0
246 : Deadlinks for resource websites	0	0	1	0	0	0	0	0	0	0	0	1	0
247 : Does not use MOLE	0	0	0	0	0	0	0	0	0	0	0	0	0
248 : Interest not captured	0	0	0	0	0	0	0	0	0	0	0	0	0
249 : Interested on outcome in learning	0	0	0	0	0	0	0	0	0	0	0	0	0
250 : Lack the needed features	0	0	1	0	0	0	0	0	0	0	0	3	0
251: Limited space provided to upload files	0	0	0	0	0	0	0	0	0	0	0	0	0
252 : MOLE upgraded to version 2	0	0	0	0	0	0	0	0	0	0	0	0	0
253 : MOLE's need to complement with another environment	0	0	0	0	0	0	0	0	0	0	0	0	0
254 : Not 100% foolproof	0	0	0	0	0	0	0	0	0	0	0	1	0
255 : Slow internet access	0	0	0	0	0	0	0	0	0	0	0	2	0
256 : Tapping experts	0	0	0	0	0	0	0	0	0	0	0	0	0
257 : Thought about alternative to feature	0	0	1	0	0	0	0	0	0	0	0	1	0
258 : Time constraints to develop learning resources	0	0	0	0	0	0	0	0	0	0	0	0	0
259 : Training design is essential	0	0	0	0	0	0	0	0	0	0	0	0	0
260 : Teaching strategy	0	2	0	0	0	0	0	0	0	0	1	0	12
261: Assignment collection	0	0	0	0	0	0	0	0	0	0	1	0	1
262 : Clustering students	0	0	0	0	0	0	0	0	0	0	0	0	0
263 : Introduction rites	0	0	0	0	0	0	0	0	0	0	0	0	0
264 : New teaching and learning paradigm	0	1	0	0	0	0	0	0	0	0	0	0	0
265 : Observe rules of pedagogy	0	0	0	0	0	0	0	0	0	0	0	0	0
266 : ORID session	0	0	0	0	0	0	0	0	0	0	0	0	2
267 : Post reading materials	0	0	0	0	0	0	0	0	0	0	0	0	1
268 : Powerpoint	1	0	0	0	0	0	0	0	0	0	0	0	0
269 : Scheduling	0	0	0	0	0	0	0	0	0	0	0	0	0
270 : Students' self-evaluation	0	0	0	0	0	0	0	0	0	0	0	0	1
271: TOP - Technology of Participation	0	0	0	0	0	0	0	0	0	0	0	0	1
272 : Useful for graduate program	0	0	0	0	0	0	0	0	0	0	0	0	0
273 : Useful in blended mode	0	0	0	0	0	0	0	0	0	0	0	0	1

APPENDIX F: Matrix of references for Low Level Concepts (Dimensions)

	Learning resource management	Interaction and communication	Feedback and assessments	Teaching performance	Forefront of Innovation	Time management	Curriculum level constraints	Students' access and economic viability	Students' work and validity of control	Needs assessments	Design	Policies	Training services	University policies	Network infrastructure & facilities	Personal satisfaction	System use
1 Learning resource management	77	20	15	17	9											26	17
2 Interaction and communication	20	99	48	24	16					9						31	20
3 Feedback and assessments	15	48	66	23												19	18
4 Teaching performance	17	24	23	47	9											30	21
5 Forefront of Innovation	9	16		9	43											26	18
6 Time management						92	10	9		38	9	26		32	28		50
7 Curriculum level constraints						10	78							20	29		40
8 Students' access and economic viability						9		66						15	31		22
9 Students' work and validity of control									45								
10 Needs assessments		9				38				126	41	38		36	33	12	70
11 Design						9				41	59	27		21	14		32
12 Policies						26				38	27	68		47	21		47
13 Training services													22	11	17		11
14 University policies						32	20	15		36	21	47	11	130	55	9	105
15 Network infrastructure & facilities						28	29	31		33	14	21	17	55	188	9	115
16 Personal satisfaction	26	31	19	30	26					12				9	9	133	70
17 System use	17	20	18	21	18	50	40	22		70	32	47	11	105	115	70	288

Appendix G: Matrix of sources for Low Level Concepts (Dimensions)

	Learning resource management	Interaction and communication	Feedback and assessments	Teaching performance	Forefront of Innovation	Time management	Curriculum level constraints	Students' access and economic viability	Students' work and validity of control	Needs assessments	Design	Policies	Training services	University policies	Network infrastructure & facilities	Personal satisfaction	System use
1 Learning resource management	23	11	10	9												13	11
2 Interaction and communication	11	22	17	11	9											15	14
3 Feedback and assessments	10	17	20	12												11	12
4 Teaching performance	9	11	12	19												16	15
5 Forefront of Innovation		9			23											15	14
6 Time management						25				16		15		14	14		19
7 Curriculum level constraints							27							12	17		21
8 Students' access and economic viability								21						9	15		13
9 Students' work and validity of control									20								
10 Needs assessments						16				29	15	16		18	17	10	27
11 Design										15	17	14		14			16
12 Policies						15				16	14	21		16	11		19
13 Training services													11		10		
14 University policies						14	12	9		18	14	16		29	21		29
15 Network infrastructure & facilities						14	17	15		17		11	10	21	32		31
16 Personal satisfaction	13	15	11	16	15					10						33	33
17 System use	11	14	12	15	14	19	21	13		27	16	19		29	31	33	33

APPENDIX H: Categorized Participants' Log Entries of Interactive Features of MOLÉ

Interactive			Interactive			Interactive			Interactive			Interactive			Interactive			Interactive			Interactive			Interactive		
Cat A - Discipline			Cat B -Position			Cat C - Gender			Cat D - Usage Mode			Cat E - Program Level			Cat F -Training			Cat G - Age Range			Cat H - Years of Teaching			Cat I -MOLE USE Exp		
Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng
Group A (5)			Admin (9)			Male (12)			Regular (16)			Both HUD (10)			Attended Training (14)			Age range: 25-44 (11)			1-15 yrs (11)			1 to 10 Sem of Use (15)		
28	6.44	Low	18	9.39	Med	26	44.74	High	26	44.74	High	18	9.39	Med	26	44.74	High	26	44.74	High	26	44.74	High	26	44.74	High
2	2.23	Low	5	4.21	Low	28	6.44	Low	18	9.39	Med	9	5.14	Low	15	34.09	High	15	34.09	High	15	34.09	High	15	34.09	High
25	0.5	Low	4	3.48	Low	3	4.48	Low	28	6.44	Low	5	4.21	Low	18	9.39	Med	3	4.48	Low	3	4.48	Low	28	6.44	Low
19	0.42	Low	22	3.30	Low	5	4.21	Low	9	5.14	Low	22	3.30	Low	9	5.14	Low	5	4.21	Low	4	3.48	Low	9	5.14	Low
33	0.16	Low	2	2.23	Low	27	2.32	Low	3	4.48	Low	2	2.23	Low	3	4.48	Low	4	3.48	Low	27	2.32	Low	3	4.48	Low
Average	1.95	Low	19	0.42	Low	6	2.26	Low	5	4.21	Low	19	0.42	Low	22	3.3	Low	27	2.32	Low	6	2.26	Low	4	3.48	Low
Median	1.23	Low	17	0.14	Low	2	2.23	Low	4	3.48	Low	33	0.16	Low	27	2.32	Low	6	2.26	Low	32	0.82	Low	27	2.32	Low
Group B (10)			14	0.11	Low	32	0.82	Low	22	3.30	Low	17	0.14	Low	25	0.50	Low	32	0.82	Low	25	0.50	Low	2	2.23	Low
26	44.74	High	31	0.06	Low	25	0.50	Low	6	2.26	Low	23	0.09	Low	19	0.42	Low	25	0.50	Low	33	0.16	Low	32	0.82	Low
15	34.09	High	Average	2.59	Low	17	0.14	Low	2	2.23	Low	31	0.06	Low	33	0.16	Low	33	0.16	Low	23	0.09	Low	25	0.50	Low
18	9.39	Med	Median	2.23	Low	31	0.06	Low	32	0.82	Low	Average	2.51	Low	17	0.14	Low	23	0.09	Low	20	0.00	Low	33	0.16	Low
9	5.14	Low	Non-Admin (13)			20	0.00	Low	25	0.50	Low	Median	1.33	Low	13	0.14	Low	Average	8.83	Low	Average	8.45	Low	17	0.14	Low
4	3.48	Low	26	44.74	High	Average	5.68	Low	19	0.42	Low	UG only (12)			14	0.11	Low	Median	2.32	Low	Median	2.26	Low	14	0.11	Low
22	3.3	Low	15	34.09	High	Median	2.25	Low	17	0.14	Low	26	44.74	High	23	0.09	Low	Age range: 45 to 65 (11)			16-30 yrs (5)			23	0.09	Low
13	0.14	Low	28	6.44	Low	Female (10)			13	0.14	Low	15	34.09	High	Average	7.50	Low	28	6.44	Low	28	6.44	Low	20	0.00	Low
14	0.11	Low	9	5.14	Low	15	34.09	High	14	0.11	Low	28	6.44	Low	Median	1.41	Low	22	3.30	Low	5	4.21	Low	Average	6.98	Low
23	0.09	Low	3	4.48	Low	18	9.39	Med	Average	5.49	Low	3	4.48	Low	Self-trained (8)			17	0.14	Low	2	2.23	Low	Median	2.28	Low
31	0.06	Low	27	2.32	Low	9	5.14	Low	Median	2.78	Low	4	3.48	Low	28	6.44	Low	9	5.14	Low	19	0.42	Low	11 to 20 Sem of Use (7)		
Average	10.05	Med	6	2.26	Low	4	3.48	Low	Supplemented (6)			27	2.32	Low	5	4.21	Low	2	2.23	Low	14	0.11	Low	18	9.39	Med
Median	3.39	Low	32	0.82	Low	22	3.30	Low	15	34.09	High	6	2.26	Low	4	3.48	Low	18	9.39	Med	Average	2.68	Low	5	4.21	Low
Group C (7)			25	0.50	Low	19	0.42	Low	27	2.32	Low	32	0.82	Low	6	2.26	Low	13	0.14	Low	Median	2.23	Low	22	3.30	Low
3	4.48	Low	33	0.16	Low	33	0.16	Low	33	0.16	Low	25	0.50	Low	2	2.23	Low	19	0.42	Low	31-45 yrs (6)			6	2.26	Low
5	4.21	Low	13	0.14	Low	13	0.14	Low	23	0.09	Low	13	0.14	Low	32	0.82	Low	31	0.06	Low	18	9.39	Med	19	0.42	Low
27	2.32	Low	23	0.09	Low	14	0.11	Low	31	0.06	Low	14	0.11	Low	31	0.06	Low	14	0.11	Low	9	5.14	Low	13	0.14	Low
6	2.26	Low	20	0.00	Low	23	0.09	Low	20	0.00	Low	20	0.00	Low	20	0.00	Low	20	0.00	Low	22	3.3	Low	31	0.06	Low
32	0.82	Low	Average	7.78	Low	Average	5.63	Low	Average	6.12	Low	Average	8.28	Low	Average	2.44	Low	Average	2.49	Low	17	0.14	Low	Average	2.83	Low
17	0.14	Low	Median	2.26	Low	Median	1.86	Low	Median	0.13	Low	Median	2.29	Low	Median	2.25	Low	Median	0.42	Low	13	0.14	Low	Median	2.26	Low
20	0.00	Low	NO LOGIN ENTRIES			NO LOGIN ENTRIES			NO LOGIN ENTRIES			NO LOGIN ENTRIES			NO LOGIN ENTRIES			NO LOGIN ENTRIES			31	0.06	Low	NO LOGIN ENTRIES		
Average	2.03	Low	Administrators (3)			Male (4)			Alternative (11)			Both HUD (8)			Trained (9)			Age range: 25-44 (4)			Average	3.03	Low	0 sem of Use (6)		
Median	2.26	Low	8		None	1		None	1		None	1		None	1		None	7		None	Median	1.72	Low	10		None
NO LOGIN ENTRIES			12		None	8		None	7		None	7		None	7		None	10		None	NO LOGIN ENTRIES			8		None
Group A (6)			21		None	10		None	8		None	8		None	8		None	24		None	1-15 yrs (3)			11		None
1		None	Non-Administrators (8)			24		None	10		None	12		None	10		None	30		None	10		None	21		None
7		None	1		None	Female (7)			11		None	16		None	11		None	Age range: 45 to 65 (7)			24		None	16		None
8		None	7		None	12		None	12		None	29		None	12		None	1		None	30		None	29		None
12		None	16		None	21		None	16		None	24		None	21		None	8		None	16-30 yrs (4)			1 to 10 Sem of Use (5)		
16		None	29		None	7		None	21		None	21		None	24		None	11		None	7		None	1		None
29		None	30		None	16		None	24		None	UG only (3)			30		None	12		None	11		None	7		None
Group B (1)			10		None	29		None	29		None	10		None	Untrained (2)			21		None	16		None	12		None
30		None	11		None	30		None	30		None	11		None	16		None	16		None	29		None	24		None
Group C (4)			24		None	11		None				30		None	29		None	29		None	31-45 yrs (4)			30		None
10		None										HD Only (0)									1		None	11 to 20 Sem of Use (0)		
11		None										0		None							8		None			
21		None																			12		None			
24		None																			21		None			

APPENDIX I: Categorized Participants' Log Entries of Non-Interactive Features of MOLÉ

Non-Interactive			Non-Interactive			Non-Interactive			Non-Interactive			Non-Interactive			Non-Interactive			Non-Interactive			Non-Interactive			Non-Interactive		
Cat A - Discipline			Cat B -Position			Cat C - Gender			Cat D - Usage Mode			Cat E - Program Level			Cat F -Training			Cat G - Age Range			Cat H - Yrs of Teaching			Cat I -MOLE USE Exp		
Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng	Ac ID	RLE*	Strng
Group A (5)			Admin (9)			Male (12)			Regular (16)			Both HUD (5)			Attended Trng (17)			Age range: 25-44 (11)			1-15 yrs (11)			1-10 Semesters of Use		
25	12.89	Med	17	55.43	High	26	77.04	High	26	77.04	High	17	55.43	High	26	77.04	High	26	77.04	High	26	77.04	High	26	77.04	High
28	2.45	Low	5	30.60	High	17	55.43	High	17	55.43	High	5	30.60	High	17	55.43	High	15	42.58	High	15	42.58	High	17	55.43	High
2	1.64	Low	14	9.84	Med	5	30.60	High	9	48.30	High	33	4.24	Low	9	48.30	High	5	30.60	High	3	14.68	Med	9	48.30	High
19	2.69	Low	18	8.66	Low	3	14.68	Med	5	30.60	High	19	2.69	Low	15	42.58	High	3	14.68	Med	25	12.89	Med	15	42.58	High
33	4.24	Low	4	7.24	Low	25	12.89	Med	3	14.68	Med	2	1.64	Low	3	14.68	Med	25	12.89	Med	4	7.24	Low	3	14.68	Med
Average	4.78	Low	22	6.75	Low	20	7.08	Low	25	12.89	Med	Average	18.92	Med	25	12.89	Med	4	7.24	Low	20	7.08	Low	25	12.89	Med
Median	2.69	Low	19	2.69	Low	27	5.89	Low	14	9.84	Med	Median	4.24	Low	14	9.84	Med	27	5.89	Low	27	5.89	Low	4	7.24	Low
Group B (10)			31	2.25	Low	6	5.37	Low	18	8.66	Low	UG only (5)			18	8.66	Low	6	5.37	Low	6	5.37	Low	20	7.08	Low
26	77.04	High	2	1.64	Low	28	2.45	Low	4	7.24	Low	26	77.04	High	22	6.75	Low	33	4.24	Low	33	4.24	Low	27	5.89	Low
9	48.30	High	Average	13.90		31	2.25	Low	22	6.75	Low	9	48.30	High	27	5.89	Low	32	1.25	Low	32	1.25	Low	33	4.24	Low
15	42.58	High	Median	7.24		2	1.64	Low	6	5.37	Low	15	42.58	High	13	4.62	Low	23	0.13	Low	23	0.13	Low	32	1.25	Low
14	9.84	Med	Non-Admin (13)			32	1.25	Low	13	4.62	Low	3	14.68	Med	33	4.24	Low	Average	18.35	Med	Average	16.22	Med	23	0.13	Low
18	8.66	Low	26	77.04	High	Average	18.05	Med	19	2.69	Low	25	12.89	Med	19	2.69	Low	Median	7.24	Low	Median	7.08	Low	28	2.45	Low
4	7.24	Low	9	48.30	High	Median	6.48	Low	28	2.45	Low	14	9.84	Med	23	0.13	Low	Age range: 45-65 (11)			16-30 yrs (5)			2	1.64	Low
22	6.75	Low	15	42.58	High	Female (10)			2	1.64	Low	18	8.66	Low	Average	20.98	High	17	55.43	High	5	30.60	High	32	1.25	Low
13	4.62	Low	3	14.68	Med	9	48.30	High	32	1.25	Low	4	7.24	Low	Median	9.25	Med	9	48.30	High	14	9.84	Med	23	0.13	Low
31	2.25	Low	25	12.89	Med	15	42.58	High	Average	18.09	Med	20	7.08	Low	Self-trained			14	9.84	Med	19	2.69	Low	Average	19.38	High
23	0.13	Low	20	7.08	Low	14	9.84	Med	Median	7.95	Low	22	6.75	Low	5	30.60	High	18	8.66	Low	28	2.45	Low	Median	7.24	Low
Average	20.74	Med	27	5.89	Low	18	8.66	Low	Supplemented (6)			27	5.89	Low	4	7.24	Low	20	7.08	Low	2	1.64	Low	11-20 Sem of Use		
Median	7.95	Low	6	5.37	Low	4	7.24	Low	15	42.58	High	6	5.37	Low	20	7.08	Low	22	6.75	Low	Average	9.44	Med	5	30.60	High
Group C (7)			13	4.62	Low	22	6.75	Low	20	7.08	Low	13	4.62	Low	6	5.37	Low	13	4.62	Low	Median	2.69	Low	18	8.66	Low
17	55.43	High	33	4.24	Low	13	4.62	Low	27	5.89	Low	28	2.45	Low	28	2.45	Low	19	2.69	Low	31-45 yrs (6)			22	6.75	Low
5	30.60	High	28	2.45	Low	33	4.24	Low	33	4.24	Low	31	2.25	Low	31	2.25	Low	28	2.45	Low	17	55.43	High	6	5.37	Low
3	14.68	Med	32	1.25	Low	19	2.69	Low	31	2.25	Low	32	1.25	Low	2	1.64	Low	31	2.25	Low	9	48.30	High	13	4.62	Low
20	7.08	Low	23	0.13	Low	23	0.13	Low	23	0.13	Low	23	0.13	Low	32	1.25	Low	2	1.64	Low	18	8.66	Low	19	2.69	Low
27	5.89	Low	Average	17.42	Med	Average	13.50	Med	Average	10.36	Med	Average	15.12	Med	Average	7.23	Low	Average	13.61	Med	22	6.75	Low	31	2.25	Low
6	5.37	Low	Median	5.89	Low	Median	6.99	Low	Median	5.07	Low	Median	7.08	Low	Median	3.91	Low	Median	6.75	Low	13	4.62	Low	Average	8.70	Low
32	1.25	Low	NO LOGIN ENTRIES			NO LOGIN ENTRIES			NO LOGIN ENTRIES			NO LOGIN ENTRIES			NO LOGIN ENTRIES			NO LOGIN ENTRIES			31	2.25	Low	Median	5.37	Low
Average	17.18	Med	Administrators (3)			Male (4)		None	Alternative (11)			Both HUD (8)			Trained (9)			Age range: 25-44 (4)			Average	21.00	High	NO LOGIN ENTRIES		
Median	7.08	Low	8		None	1		None	1		None	1		None	1		None	7		None	Median	7.70	Low	0 sem of Use (6)		
NO LOGIN ENTRIES			12		None	8		None	7		None	7		None	7		None	10		None	NO LOGIN ENTRIES			10		None
Group A (6)			21		None	10		None	8		None	8		None	8		None	24		None	1-15 yrs (3)			8		None
1		None	Non-Administrators (8)			24		None	10		None	12		None	10		None	30		None	10		None	11		None
7		None	1		None	Female (7)			11		None	16		None	11		None	Age range: 45 to 65 (7)			21		None	21		None
8		None	7		None	12		None	12		None	29		None	12		None	1		None	24		None	24		None
12		None	16		None	21		None	16		None	24		None	21		None	8		None	30		None	16		None
16		None	29		None	7		None	21		None	21		None	24		None	11		None	16-30 yrs (4)			29		None
29		None	30		None	16		None	24		None	UG only (3)			30		None	12		None	7		None	1 to 10 Sem of Use (5)		
Group B (1)			10		None	29		None	29		None	10		None	Untrained (2)			21		None	11		None	1		None
30		None	11		None	30		None	30		None	11		None	16		None	16		None	16		None	7		None
Group C (4)			24		None	11		None				30		None	29		None	29		None	29		None	12		None
10		None										HD Only (0)		None				31-45 yrs (4)			24		None			
11		None										0		None				1		None	30		None	11 to 20 Sem of Use (0		
21		None																8		None						
24		None																12		None						
																		21		None						

APPENDIX J: Matrix of references per category on all dimensions

	Participants	Learning resource management	Interaction and communication	Feedback and assessments	Teaching performance	Forefront of Innovation	Time management	Curriculum level constraints	Students' access and economic viability	Students' work and validity of control	Needs assessments	Design	Policies	Training services	University policies	Network infrastructure & facilities	Personal satisfaction	System use
A_Academic Discipline																		
Grp A_Eng'g, Sci, and Maths	**11**	21	27	12	9	15	32	26	24	20	41	24	16	6	37	52	43	89
Grp B_Soc Sci, Arts, & Educ	**11**	20	45	30	16	19	30	33	25	12	46	13	33	5	56	73	52	101
Grp C_Bus, Nursg, & C S	**11**	36	27	24	22	9	30	19	17	13	39	22	19	11	37	63	38	98
B_Academic Position																		
With administrative load	**12**	32	51	27	25	26	32	34	19	21	60	45	42	10	75	69	57	130
With NO administrative load	**21**	45	48	39	22	17	60	44	47	24	66	14	26	12	55	119	76	158
C_Gender																		
Female	**16**	26	45	28	14	15	53	37	31	17	65	25	41	8	70	85	57	144
Male	**17**	51	54	38	33	28	39	41	35	28	61	34	27	14	60	103	76	144
Usage Mode																		
Alternative	**10**	4	2	2	3	3	33	20	8	11	21	13	13	8	32	42	17	92
MOLE only	**17**	48	80	50	36	32	46	46	36	28	83	42	51	12	87	104	94	147
Supplemented	**6**	25	17	14	8	8	13	12	22	6	22	4	4	2	11	42	22	49
Program Level																		
HUD_Both UG & HD	**18**	44	52	25	22	29	50	37	36	27	75	48	47	14	87	96	76	171
Undergraduates only	**15**	33	47	41	25	14	42	41	30	18	51	11	21	8	43	92	57	117
Training Mode Attended																		
Not trained	**2**						1	1	1	4	3				1	2	4	10
Self-trained	**9**	26	32	29	22	14	12	22	16	8	28	14	10	8	24	54	37	67
Trained	**22**	51	67	37	25	29	79	55	49	33	95	45	58	14	105	132	92	211
Age Range																		
25 to 44 years old	**15**	30	43	38	23	14	41	46	41	16	64	22	18	12	33	99	47	109
45 to 65 years old	**18**	47	56	28	24	29	51	32	25	29	62	37	50	10	97	89	86	179
Teaching years																		
1 to 15 years	**14**	35	40	36	20	12	38	40	39	15	54	15	16	11	30	97	46	106
16 to 30 years	**9**	14	22	12	14	11	18	14	14	14	34	16	14	6	26	37	35	75
31 to 45 years	**10**	28	37	18	13	20	36	24	13	16	38	28	38	5	74	54	52	107
MOLE Semester Exprnc																		
I_0 semesters	**6**					1	22	13	4	6	15	11	7	3	19	17	8	58
1 to 10 semesters	**20**	56	75	51	37	28	53	47	47	30	79	27	31	9	62	128	91	166
11 to 20 semesters	**7**	21	24	15	10	14	17	18	15	9	32	21	30	10	49	43	34	64
J_Interactive																		
Low	**19**	66	72	54	41	32	44	51	45	31	79	32	40	13	78	113	95	159
Medium	**1**	1	8	3		2	6	2	8	2	7	6	9		13	11	6	20
High	**2**	5	10	7	3	3	2	5	5		7		1	1	1	15	11	11
Non-Interactive																		
Low	**14**	42	51	38	21	24	35	30	37	14	54	22	35	11	63	93	65	122
Medium	**3**	7	11	6	7	3	8	15	11	14	17	5	5		16	19	15	31
High	**5**	23	28	20	16	10	9	13	10	5	22	11	10	3	13	27	32	37
Log Entries																		
With logs	**22**	72	90	64	44	37	52	58	58	33	93	38	50	14	92	139	112	190
Without logs	**11**	5	9	2	3	6	40	20	8	12	33	21	18	8	38	49	21	98

APPENDIX K: Matrix of sources per category on all dimensions

	Participants	Learning resource management	Interaction and communication	Feedback and assessments	Teaching performance	Forefront of Innovation	Time management	Curriculum level constraints	Students' access and economic viability	Students' work and validity of control	Needs assessments	Design	Policies	Services	University policies	Network infrastructure & comp facilities	Personal satisfaction	System use
A_Academic Discipline																		
Group A_Eng'g, Sci, and Maths	11	7	6	3	4	8	8	8	7	8	10	5	7	2	10	10	11	11
Group B_Soc Sci, Arts, & Educ	11	8	9	9	8	10	8	11	8	5	9	5	8	4	9	11	11	11
Group C_Bus, Nursg, & Comp Stud	11	8	7	8	7	5	9	8	6	7	10	7	6	5	10	11	11	11
B_Academic Position																		
With administrative load	12	9	10	7	7	11	9	8	7	10	11	11	10	4	12	12	12	12
With NO administrative load	21	14	12	13	12	12	16	19	14	10	18	6	11	7	17	20	21	21
C_Gender																		
Female	16	9	8	8	7	10	13	14	9	8	14	8	10	4	13	15	16	16
Male	17	14	14	12	12	13	12	13	12	12	15	9	11	7	16	17	17	17
D_Usage Mode																		
Alternative	10	2	2	1	2	3	8	8	4	6	8	4	5	4	8	9	10	10
MOLE only	17	15	16	14	12	16	13	14	11	11	16	12	14	6	17	17	17	17
Supplemented	6	6	4	5	5	4	4	5	6	3	5	1	2	1	4	6	6	6
E_Program Level																		
HUD_Both UG & HD	18	13	12	9	8	13	13	13	11	15	17	12	13	6	17	17	18	18
Undergraduates only	15	10	10	11	11	10	12	14	10	5	12	5	8	5	12	15	15	15
F_Training Mode Attended																		
Not trained	2						1	1	1	2	2				1	1	2	2
Self-trained	9	8	8	8	8	6	6	7	7	5	8	5	5	4	8	9	9	9
Trained	22	15	14	12	11	17	18	19	13	13	19	12	16	7	20	22	22	22
G_Age Range																		
25 to 44 years old	15	10	11	11	11	10	12	15	11	7	14	7	9	7	13	15	15	15
45 to 65 years old	18	13	11	9	8	13	13	12	10	13	15	10	12	4	16	17	18	18
H_Teaching years																		
1 to 15 years	14	10	10	11	11	9	11	13	11	6	12	6	8	6	11	14	14	14
16 to 30 years	9	5	5	3	4	5	7	7	6	6	9	4	5	2	8	8	9	9
31 to 45 years	10	8	7	6	4	9	7	7	4	8	8	7	8	3	10	10	10	10
I_MOLE Semester Experience																		
I_0 semesters	6					1	5	4	2	4	5	3	3	1	5	5	6	6
1 to 10 semesters	20	16	16	13	15	16	16	16	15	12	18	9	12	6	17	20	20	20
11 to 20 semesters	7	7	6	7	4	6	4	7	4	4	6	5	6	4	7	7	7	7
J_Interactive																		
J_Low	19	18	16	16	15	17	14	16	14	12	17	11	13	6	18	19	19	19
J_Medium	1	1	1	1		1	1	1	1	1	1	1	1		1	1	1	1
J_High	2	1	2	2	2	1	1	2	2		2		1	1	1	2	2	2
K_Non-Interactive																		
K_Low	14	13	11	12	9	12	10	12	10	7	12	7	9	5	13	14	14	14
K_Medium	3	3	3	2	3	3	2	3	3	3	3	2	2		3	3	3	3
K_High	5	4	5	5	5	4	4	4	4	3	5	3	4	2	4	5	5	5
L_Log Entries																		
With logs	22	20	19	19	17	19	16	19	17	13	20	12	15	7	20	22	22	22
Without logs	11	3	3	1	2	4	9	8	4	7	9	5	6	4	9	10	11	11

APPENDIX L: References for low, high, and no usage of interactive and non-interactive features of MOLÉ

	LMS Features	INTERACTIVE		NON-INTERACTIVE		Without Logs
	Usage Strength	Low	High	Low	High	
	Participants	19	3	14	8	11
CONCEPTS	DIMENSIONS	References				
Drivers	Learning resource management	66	6	42	30	5
	Interaction and communication	72	18	51	39	9
	Feedback and assessments	54	10	38	26	2
	Teaching performance	41	3	21	23	3
	Forefront of Innovation	32	5	24	13	6
Learning environment constraints	Time management	44	8	35	17	40
	Curriculum level constraints	51	7	30	28	20
	Students' access and economic viability	45	13	37	21	8
	Students' work and validity of control	31	2	14	19	12
Training constraints	Needs assessments	79	14	54	39	33
	Design	32	6	22	16	21
	Policies	40	10	35	15	18
	Training services	13	1	11	3	8
Institutional level constraints	University policies	78	14	63	29	38
	Network infrastructure & facilities	113	26	93	46	49
Outcomes	Personal satisfaction	95	17	65	47	21
	System use	159	31	122	68	98

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